

Consequences of Deregulation and Organisational Restructuring on Job Content and Occupational Health in the Norwegian Electric Energy Sector

By Kristine Fjone Godal

2004



Institute of Sociology, University of Bergen

CONTENTS

<u>CONTENTS</u>	<u>2</u>
<u>ACKNOWLEDGEMENTS</u>	<u>4</u>
<u>ABSTRACT</u>	<u>5</u>
<u>I INTRODUCTION</u>	<u>6</u>
THEORETICAL AND METHODOLOGICAL FRAME	6
THEORETICAL MODEL OF THE THESIS	7
RESEARCH DESIGN	8
PROGRESSION PLAN	9
THE TRANSFORMATION OF WORK	10
CHANGES IN JOB CONTENT	11
IMPACT OF NEW TYPES OF EMPLOYMENT ON HEALTH	14
<u>II RESEARCH SETTING</u>	<u>17</u>
REGULATORY CHANGES IN NORWEGIAN PUBLIC SECTOR ACTIVITIES	17
DEREGULATION IN THE NORWEGIAN ELECTRIC ENERGY BRANCH	18
<u>III THEORETICAL APPROACH</u>	<u>25</u>
WORK AND HEALTH	25
PSYCHOLOGICAL AND PHYSIOLOGICAL CONSEQUENCES OF NEW TYPES OF EMPLOYMENT	25
THE PSYCHOSOCIAL WORK ENVIRONMENT	29
JOB CONTENT	29
OCCUPATIONAL HEALTH	33
THE DEMAND/CONTROL MODEL	37
“PSYCHOLOGICAL FALLACY”	37
THE DEMAND/CONTROL MODEL	38
THE DEMAND/CONTROL MODEL AND LEARNING	43
EMPIRICAL EVIDENCE FOR THE DEMAND/CONTROL MODEL	46
CRITIQUE OF THE DEMAND/CONTROL MODEL	48
<u>IV DATA AND METHOD</u>	<u>51</u>
DESIGN AND SAMPLE SIZE	51
RESPONSE RATE AND DEMOGRAPHICS OF THE STUDY	52
MEASUREMENT INSTRUMENTS	53
DATA ANALYSIS	54
ADVANTAGES AND DISADVANTAGES OF LONGITUDINAL DESIGNS	55
METHODOLOGICAL COMMENTS	56

<u>V JOB CONTENT</u>	<u>59</u>
CHANGES IN PSYCHOLOGICAL JOB DEMANDS, JOB CONTROL AND SOCIAL SUPPORT	62
<u>VI TEAM WORK</u>	<u>72</u>
<u>VII OCCUPATIONAL HEALTH</u>	<u>75</u>
JOB STRESS	76
JOB SATISFACTION	78
SUBJECTIVE HEALTH COMPLAINTS	81
<u>VIII CONCLUSION</u>	<u>88</u>
MAIN EMPIRICAL FINDINGS	88
METHODOLOGICAL CONSIDERATIONS AND STUDY LIMITATIONS: LESSONS FOR THE FUTURE	89
CONSEQUENCES OF DEREGULATION AND REORGANISATION ON OCCUPATIONAL HEALTH	91
<u>REFERENCES</u>	<u>93</u>

ACKNOWLEDGEMENTS

I first of all want to thank Professor, PhD Aslaug Mikkelsen at Stavanger University College who has made it possible for me to write this thesis by letting me use available data from the *Health in Working Life* project. Aslaug has been invaluable, and provided practical help, support and motivation whenever I needed, throughout the whole process.

I also want to thank PhD Hans-Tore Hansen, Institute of Sociology, University of Bergen, for preliminary help to and throughout the project, and for taking the time to read and comment on my work despite his stay in USA. His advice has been very helpful and valuable for my work on the thesis.

My co-students at the Institute of Sociology have given me an inspiring work environment which I am very grateful for. And last, but not least, thanks to my parents and sister for their encouragement!

Kristine Fjone Godal

Bergen, May, 2004

ABSTRACT

The study, on which this thesis is based, is part of a larger research program entitled *Work Design, Productivity and Health* funded by the Norwegian Research Council as part of the *Health in Working Life* research program. The longitudinal study was conducted in thirteen electricity generation and distribution companies in Norway from 1999 to 2002.

There has been a change in the work organisation in the Norwegian electric energy branch since the deregulation in 1991. The new competitive situation for the electric energy sector has led to a need for restructuring and flexibility. The industry has been forced to change its primary focus from engineering and technical issues to a critical concern on customers, service, operational costs and productivity. This thesis tries to detect any consequences of deregulation and restructuring on job content and occupational health using Robert Karasek and Töres Theorell's Demand/Control Model as a basis.

The analyses showed small overall changes in *psychological job demands*, *job control*, *social support* and *team work* from 1999 to 2002. However, on item-level, some of the variables from the *demands* and *control* scales showed significant changes from 1999 to 2002.

Regression analyses were done to detect if *psychological job demands*, *job control*, *social support*, *team work* and *leadership* had any influence on *job stress*, *job satisfaction* and *subjective health complaints*. The results showed that *psychological job demands* had a negative effect on *job stress*, *job satisfaction* and *subjective health complaints*. *Job control* and *social support* had, on the other hand, a positive effect on the same dependent variables. The *leadership* variable was positively related to *job stress* and *job satisfaction*, but negatively related to *subjective health complaints*. In this study *team work* had generally little effect on the dependent variables, except from a positive correlation to *job satisfaction*.

The results in this study corroborate previous results and suggest that the Demand/Control Model can be used as a practical approach in understanding healthy work in the Norwegian electric energy branch.

Key words:

Deregulation, psychological job demands, job control, social support, the Demand/Control Model, team work, learning, sick leave, job stress, job satisfaction and subjective health complaints.

I INTRODUCTION

The study, on which this thesis is based, is part of a larger research program entitled *Work Design, Productivity and Health* funded by the Norwegian Research Council as part of the *Health in Working Life* research program. The study was conducted in the electricity generation and distribution industry in Norway. The new situation for the electrical power industry in Norway during the 1990s changed the focus from a specific field, such as engineering, to a focus on customer, flexibility, competence and costs. In addition to organisational restructuring came job redesign and downsizing. *The Health in Working Life Project's* two purposes were to study how changes in work organisation and management affect the health and the work environment of the employees, and to use this new knowledge to develop effective interventions to improve health (Mikkelsen, Øgaard & Landsbergis 2002).

The aim of this thesis is to see if there have been any changes in job content and occupational health in the Norwegian electric energy branch, during a period where deregulation and organisational restructuring has had an effect on the sector.

THEORETICAL AND METHODOLOGICAL FRAME

Work organisation, work environment and health are subject areas which are especially suitable for interdisciplinary studies. Studies on these topics can be carried through both *within* disciplines (for instance medical sociology, work sociology or organisational sociology), *between* different social sciences (for example sociology, administration and organisation theory and economics) and between disciplines (such as social sciences, psychology and medicine) (Hansen 1999).

As part of a larger research program this sociological study borders different special fields such as health psychology and medicine. A more multidisciplinary approach to subjects of health and work can be advantageous to see matters as part of a greater whole. The thesis is therefore based on both sociological and psychological theories of current interest for work and health. Relevant sociological theories and concepts describing the changing work are used in this thesis (as *flexibility*, *restructuring*, *team work* and *downsizing*), together with

psychological concepts (as *psychological job demands*, *job control*, *social support*, *stress*, *subjective health* and *job satisfaction*).

Robert Karasek and Töres Theorell's (1990) Demand/Control Model is essential to this thesis, and it has encouraged and generated many studies concerning the quality of work, and job content in particular. According to Karasek and Theorell the model "occupies an intellectual 'middle ground' equidistant from two major scientific belief areas and can serve as a micro-level reference point for psychologists, medical scientists, and personnel managers (...) as well as for job designers and sociologists" (Karasek & Theorell 1990: 57). According to J. de Jonge and M. Kompier the model has proved to be an influential theoretical framework, particularly in job stress and in job redesign research on several different disciplines (de Jonge & Kompier 1997).

Theoretical model of the thesis

The first main assumption in this thesis is that in a period after deregulation and organisational restructuring there will be a change in job content. The second main assumption in this thesis is that changes in job content will have an effect on occupational health. A third assumption is that deregulated market conditions will influence work organisation in form of team work, a change that will affect occupational health. The assumptions are illustrated in Figure 1 below.

Fig 1. *Theoretical model - the relationship between deregulation, job content and occupational health*

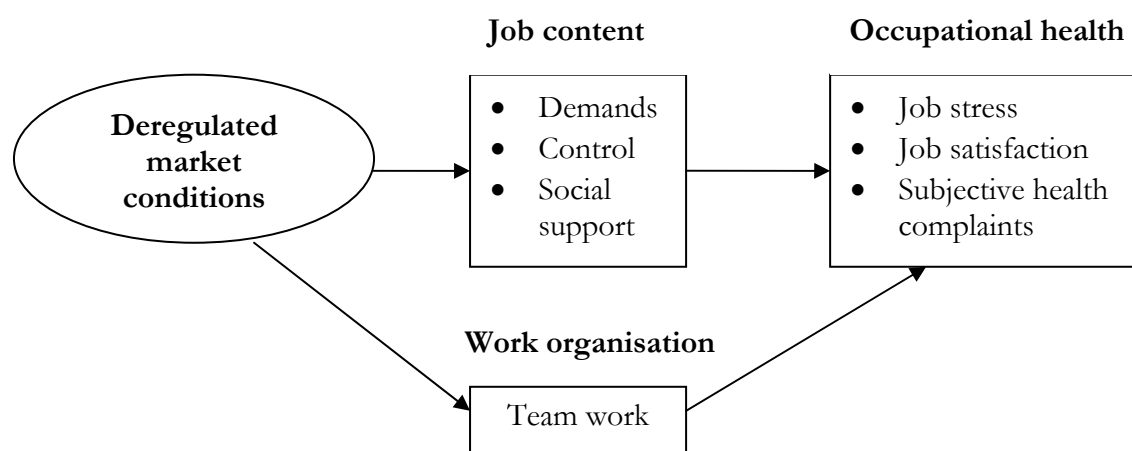


Figure 1 shows the presumptive causal relationship between the electric energy branch in a period after a deregulation resolution and the effect this has had on job content in the sector. Job content may be categorised in three main dimensions; *psychological job demands*, *worker control* and *social support*. Figure 1 further shows the effect changes in job content have on occupational health. Occupational health may be categorised in three main dimensions; *job stress*, *job satisfaction* and *subjective health complaints* (Karasek & Theorell 1990). Figure 1 further shows the effect of a period of deregulation and organisational restructuring on work organisation in the form of team work. Further the figure shows that team work may have an influence on occupational health such as job stress, job satisfaction and subjective health complaints.

Research design

This thesis studies the Norwegian electric energy branch, a sector influenced by deregulation and organisational restructuring. Reports from the branch show restructuring actions, such as downsizing, but also general tendencies towards more team work and flexibility. Because of the extensive changes in the Norwegian electric energy sector the last decade, the branch constitutes a relevant case when studying the transformation of work and its consequences for workers health.

Access to suitable data for my study was obtained through Professor, PhD Aslaug Mikkelsen and Rogaland Research. The data was collected in a project called *Restructuring the electric energy industry: work design, productivity and health* which was funded by the Norwegian Research Council as part of the intervention program *Health in Working Life*. Three surveys by a postal questionnaire were arranged by Rogaland Research, the first one in 1999, the second in 2000 and the last in 2002. The responses were encoded and added as SPSS-files, and standard statistical tests from the SPSS package were used for all analysis reported in this thesis.¹

Validity

One can question if the data used in this thesis actually *can* describe the consequences of the New Norwegian Energy Act of 1991. The data were collected 8 to 12 years after the deregulation in 1991, which can question the usefulness of the information.

¹ SPSS (Statistical Package for the Social Sciences): A statistical program which use is extensive in data analysis within social sciences.

There are several possible solutions which could have solved this validity problem. One solution would have been to carry out the surveys closer up to the deregulation following the Energy Act of 1991. Surveys too close to 1991 would, however, not grasp the major organisational changes. The changes in the electrical energy companies in Norway arose at different moments in time for all companies, and it took several years before organisational restructuring actually started and had extensive consequences at company level.

In addition to this, the changes in the branch had a “domino”-effect. A merge between two companies resulted in changed strategies of others. In this way different changes happened at different times for the different companies, and a comparison between companies at one point of time would not imply that they were in the same situation. In the case of mergers and purchases the power balance between the companies continuously changed, so what BKK did would have consequences for what Lyse, Statkraft or Hafslund did, and vice versa. With an ongoing change in positioning and balance of power, several difficulties concerning reliability and validity might occur in the years close to the deregulation resolution, with an increased consolidation, however, after some years. The research design could have been improved, if baseline registrations were taken before the law was effected.

Even if the data used in this study could have problems of showing direct consequences of the deregulation resolution, it *can* show valid results of impacts, a period influenced by deregulation and organisational restructuring, has had on the branch and its workers.

Progression plan

In this thesis I will first present different changes in job content seen the recent years, and show how these changes might impact worker health. Further I will introduce the research setting through the concept of deregulation, and describe the development of the deregulation process in the Norwegian electric energy branch. The theoretical approach will first describe psychological and physiological consequences of new types of employment. Important concepts describing the psychosocial work environment will then be introduced. Further, Robert Karasek and Töres Theorell’s Demand/Control Model, which is essential for this thesis, will be thoroughly presented. This chapter will also introduce learning as part of Karasek and Theorell’s model, and empirical evidence and critique of the model. The data and method-chapter starts with a presentation of the design and sample size of the study. Further the response rate and demographics of the study are presented. Next the

measurement instruments are presented, together with a brief introduction of the data analyses of this study, and advantages and disadvantages of longitudinal designs. Chapter IV is rounded off with different methodological comments. The results from the analyses are thereupon presented with tables and discussions in chapter V to VII, where chapter VII will constitute the main chapter. The thesis is concluded with a chapter with main empirical findings, methodological considerations, study limitations and implications for further research.

THE TRANSFORMATION OF WORK

In the beginning of a new millennium many aspects of our social world, work and economic life are undergoing enormous transformations. These rapid and fundamental changes are observed all around the world, and influence almost every aspects of life. Some countries report an increase in social stress, but other countries have managed to stay stable throughout massive transformation processes. One key area for such transformations is working life, which has secondary effects on virtually all other areas of human existence (Castells 2000).

The workforce in industrialised countries has experienced substantial changes in job characteristics over the past generation, especially during the 1990s. It has been claimed that there is a rather limited understanding of the effects of these new trends on job characteristics and on workers health and well-being. Some of these changes seen in organisations may be in the interest of the employees, such as autonomy, control, creativity and possibilities of learning. These are all aspects of organisational change which can represent an end to alienation and distress at work for the employee. Others again claim that the transformation of work represents new and damaging aspects to workers health and well-being (Sennett 2001).

There are different approaches to the problems concerning the changing work. The transformation of work is an extensive area, and several important and interesting questions arise from it. This thesis will concentrate on some selected issues concerning changes in job content and occupational health.

Changes in job content

In several ways and for a variety of reasons, the expectations, norms, rules and procedures within organisations are changing. “Corporate mergers”, “downsizing”, “business acquisitions”, “outsourcing”, “customizing”, “lay offs” and “restructuring” are catchwords we see daily in the news, together with reports of the impact information technology has had on the work place and other new organisational routines. New social and economic organisations which are based on information technology aims at decentralised management, individualising work and customising markets. The result is, according to Manuel Castells (2000), *segmenting* work and *fragmenting* societies. This tendency of variation and diversity in work relations, working hours and types of work, are increasing throughout the western world.

A branch, which we can assume has experienced different changes in work organisation through the recent years, is the Norwegian electric energy branch. This sector was exposed to market competition and saw restructuring initiatives during the 1990s, and concepts as “restructuring”, “flexibility”, “team work” and “downsizing” were incorporated in everyday language in the branch. Due to the popularity of these concepts there arises a necessity for insight into the new trends (Mikkelsen, Nybø & Grønhaug 2002).

Restructuring

There are a number of factors which cause and motivate the companies’ opportunities and requirements for restructuring. Their activities are played out on a “global stage”, and changes like innovative technology, transformed communication and production techniques, expansion of the service sector, financial turbulence and increased market competition are reflected in the increasing degree of variation and diversity both in working hours, job characteristics and job content. This drive towards flexibility has forced different branches and sectors to restructure themselves (Olberg 1990). The term “restructuring” has many significations, but it is usually thought of as some kind of innovative reorganisation of work practices where the goal is flexibility and cost reductions (Osterman 1999). There are different examples of “flexible solutions”: Working time arrangements, home office, downsizing, outsourcing, use of temporary and contingent labour are all examples of flexible

solutions (Watson 1995). Together with these solutions, there is a flow of new management concepts like TQM, BPR, JIT and lean production (Rolfsen 2000).²

Flexibility

John Atkinson (1984) describes how the new competitive situation for different companies and sectors, makes them look for a larger variety in both number of employees and the job tasks the employees perform. The competitive situation also involves a need for economic freedom of action, which Atkinson presents as different types of flexible solutions (Atkinson 1984). Flexible practises are now being introduced in most branches because the firms have a need to be alert and responsive to customer needs and competitor threats (Tregaskis, Brewster, Mayne & Hegewisch 1998). Flexible methods are presented in different areas, such as product development, production techniques, management style, working environment, employee involvement and marketing (Giddens 1997). Flexible solutions is a result of employers' search for new and effective production methods and a workforce which can respond quickly, easily and cheaply to changes (Atkinson 1984).

The concept of flexible organisation is not new, and a certain degree of flexibility has always existed in employment patterns to meet production or service demands. Even though flexibility has been discussed for the last 20 years in the Human Resource Management (HRM) literature, there exists no dominating agreed upon definition (Sparrow 1998). Most often, however, flexibility involves an employer's capacity to ensure a rapid labour adaptation by lowering wages, demanding working conditions or changes as a result of new technology. There are several common understandings of the concept "flexibility", which imply numerous different implications and methods. Examples of this can be "downsizing", "contingent employment", "outsourcing" or "layoffs" (Osterman 1999). Additionally "group production", "problem-solving teams", "multitasking" and "niche marketing" are just some of the strategies which have been adopted by companies attempting to restructure themselves under shifting conditions (Giddens 1997).

² *Total Quality Management (TQM)* is "an approach to the production of goods and services in which employees at all levels focus on 'satisfying customers', use statistical and other techniques to monitor their work and seek continuous improvement in the processes used and the quality of what is produced". *Business Process Reengineering (BPR)* is the "restructuring of an organisation to focus on business processes rather than on business functions. Advanced management control information technologies are used together with team working and employee 'empowerment'". *Just-In-Time (JIT)* is a way of "organising production processes so that no buffer stocks are held in the factory, with materials and components only being delivered immediately before they are required". *Lean Production* is "combining teamwork with automated technologies. Workers are required both to initiate 'continual improvements' in quality and to ensure that every task is got 'right first time' and completed to a demanding 'just-in-time' schedule" (Watson 2003: 115-118).

Ever since the concept of “flexibility” was brought into fashion during the 1990s, there simultaneously emerged a variety in flexible organisational and employment patterns in organisations around the world (Benach et al. 2002).

Downsizing

The concept of downsizing can more precisely be defined as a “planned elimination of positions or jobs” (Kets de Vries & Balazs 1997). Downsizing and other work design implications of transformation can be quite similar, especially since they often involve reduction in an organisations’ headcount (Parker & Wall 1998).

The phenomenon of downsizing is relatively new, and has become a favourite business method for a large number of corporations. For some especially troubled organisations, downsizing is the inevitable outcome of globalization and the continual adjustments to products, services and the price of labour which are needed to remain competitive (Kets de Vries & Balazs 1997). Downsizing is not something that *happens* to an organisation, it is an activity purposively undertaken by the members of an organisation; it is sets of activities which are designed to improve organisational efficiency, productivity, and competitiveness. To improve organisational efficiency downsizing usually involve reductions in personnel and costs (Mikkelsen, Nybø & Grønhaug 2002).

Teamwork

A “team” can be defined as “a form of group-based work activity in which a degree of discretion is left to group members, acting in a co-operative manner, about how they perform the tasks allocated to them” (Watson 2003: 116). The teams often consist of employees with different skills and qualifications, and its constellation may be constructed on an ad hoc basis, or be stable through time (Kreitner, Kinicki & Buelens 1999).

The team’s flexibility is achieved through job rotation or flexible choice of tasks. This implies that the workers are expected to work in a more fluid way, together with co-workers or outside consultants for short-term projects. When the project is carried through, the team often dissolves, and its members moves on to new projects. By bringing together employees from different backgrounds, small teams can maximise the skills and contribution of each member and achieve more creative problem-solving (Giddens 1997). Advantages of team

work are effective problem solving, competence development, experience transfer, participation and job autonomy (Flecker & Hofbauer 1998). It has also been claimed that the working moral and the loyalty to colleagues will become more productive if the workers identify with a team (Rolfen 2000).

Impact of new types of employment on health

During the typical industrial work organisation the strain was mainly physical. The employees had to work long hours in bad physical conditions. Industrial production was especially a hazard to the employees' health, both through the job content and through the work environment in general (Hansen 1999). The worker was not protected to the same degree by the work environmental legislation as today, and they put their own health at stake in order to be loyal workers (Flecker & Hofbauer 1998). In the 20th century's Norway, on the other hand, the workers have been safe, and have to a considerable degree been protected by a substantial work environmental law.

The new systems of work organisation may offer increased flexibility, responsibility and learning opportunities, but deregulations and increased labour market flexibility may have other consequences for the employees as well. The globalisation of economic activity, in particular the accelerating internationalisation of trade, investments and finance, is increasingly acknowledged as a force that is having a profound negative impact on material and psychological conditions, work intensification and health (Landsbergis, Schnall & Cahill 1999). One could assume a good intention behind flexibility, downsizing and restructuring, but the drive towards flexibility may also create confusion and uncertainty in the workforce with a potential risk of harming their health (Reilly 1998). This could, according to Karasek and Theorell (1990) be seen in large industrial working populations, as the United States and Sweden. These countries, which should experience high levels of job satisfaction, instead report increasingly more stress and depression. They explain this with the rapid and continuous changes which appear in the modern and flexible organisations. They claim that the "new workers" encounter several new requirements, such as changes in job content and increased demands, which influence on their health and satisfaction (Karasek & Theorell 1990).

Some would say that workers today often are considered to be key resources in each organisation, and that they are independent, autonomous and problem solving individuals.

Others again claims that the new flexible organisations also can represent an “attack” on the employees’ health and work environment, as new forms of stress and strain occurs. Richard Sennett (2001) presents some of the personal consequences of work, in what he calls the “new capitalism”. The “new capitalism” is characterised by massive and qualitative changes in working life as a result of the transformation from a bureaucratic organisation with mass production to flexible production. He claims that we are entering a new era where energy- and machine dominated industrialism is replaced by information and knowledge, and where personal knowledge, mobility or flexibility is important for the “character”. Where the old capitalism created standards and routines that dehumanised workers; now *individuals* are coming to work, not *manpower*. But even if the new capitalism can represents an improved situation for many workers, the new ways of production can create new and negative demands. The work place demands competence and total devotion from their employees, which easily ends up as restlessness, anxiety and emptiness. So according to Sennett, even though the new capitalism involves an extreme individualisation; the more you accomplish, the more you lose yourself (Sennett 2001).

According to Flecker and Hofbauer (1998: 119) the organisational flexibility can be seen as merely a blind for rationalisation actions. According to Töres Theorell (1989) changes in work organisation can affect the employees’ health, and he especially focuses on how employee stress increases when the organisations are becoming lean or rationalised. Conspicuous for the threatened organisations are the low degree of control and demands, and consequently the negative stress is also the highest in these threatened organisations. Those who work in these organisations are more exposed to strain, which can result in psycho-physiological outcomes. All organisational insecurity and instability can, according to Töres Theorell, constitute a risk for the employees’ health (Färm 2000).

Others describe how flexible solutions may have unintended consequences which may deteriorate the working conditions. The modern industrial organisation appears to trade off the workers psychological well-being for material prosperity (Landsbergis, Schnall & Cahill 1999). Robert Karasek and Töres Theorell (1990) claim that such solutions as downsizing, flexibility and team work are not focusing on employees’ well-being, but on *efficiency*, *economic rationality* and *productivity*. In their book called *Healthy Work: Stress, Productivity, and the Reconstruction of Working Life* (1990) they present another perspective of restructuring.

According to Karasek and Theorell (1990), restructuring or *job redesign* should not only focus on *physical reality* and the impersonal financial rewards of work, but on the *social processes* at work. They emphasize the importance of control when changing the structure of an organisation, because decision latitude can be used to predict health and productivity. Job redesigning should first and foremost be done to benefit the workers in an organisation, not the budget. Karasek and Theorell claim that the employee's well-being is an "intermediate step on the pathway to profitability", and that a happy worker is also a productive worker (Karasek & Theorell 1990: 169). It is therefore vital to healthy working life to identify ways to overcome current difficulties and to prevent difficulties in the future. They suggest that instead of reducing stress, by addressing the symptoms with, for example, relaxation therapy; one should change or modify the *source* of the problem, namely the organisation of work (Karasek & Theorell 1990).

II RESEARCH SETTING

Regulatory changes in Norwegian public sector activities

The 1990s has been a decade of change and deregulation for industries and sectors in Norway as well as in many other countries. Deregulation is characterised by a decreasing influence of governmental regulation, with increased freedom of action for some sectors and whole branches. Regulations on the market are reduced, and the main principle is that supply and demand shall regulate the activity. This means free market competition and free flow of commodities and services. Deregulation often involves a reduction in number of laws, statutes and regulations which control the relation between different actors. Another governmental line of action is through application of taxes and licenses (Leknes, Opedal & Reiersen 2000).

In Norway deregulations started in several areas from the mid 1980s and one early example is the Norwegian aviation market. The Norwegian air traffic was gradually deregulated from the end of the eighties, with a decisive and important change in April 1994 when free competition in Norwegian coastal trade was legalised. Similar changes happened in the Norwegian telecommunication sector. Up until the early 1990s this was a monopolised administrative business under the responsibility of Norwegian Telecom (Televerket), but during the nineties also this sector was deregulated. Furthermore, both the Norwegian Postal Administration and the Norwegian State Railways changed their relationship to the government in 1996, as they both went from administrative businesses to public limited corporations.³ Another and very clear example of deregulation is seen in the Norwegian energy branch, which has gone through several and profound changes in the last decade (Leknes et al. 2000).

There have been huge changes in the energy branch in a number of countries during the last decade. The sector has moved from a branch where engineers were in charge of planning both investments and production, to an economy controlled branch where profit and surplus are paramount (Bowitz, Rosnes & Vennemo 2001). This new situation was initiated through the changes seen in the energy branch from the 1980s (Farsund 1998, 195).

³ Særlovsavtale selskap

Deregulation in the Norwegian electric energy branch

The work on the Energy Act started in 1980 with the appointment of the Energy Legislation Committee.⁴ The new Energy Act aimed to both increase the efficiency of energy producing units and to develop an industry which would, to a larger degree, advance economised energy. The committee submitted a report in 1985, but the Norwegian market liberalisation in the energy branch was not carried through until the Norwegian Energy Act became law in January 1991.

Norwegian energy policy

The power plants were until the new Energy Act in 1991 monopolistic and obliged to deliver energy to consumers within defined geographical areas. Statkraft SF sold its energy to the manufacturing industries and other power plants for prices decided by the Norwegian Parliament.⁵ The prices from the local power plants were, on the other hand, decided by the local governments. The price on energy was set to cover the production cost, and any production surplus was sold at reduced prices to neighbouring countries (Leknes, Opedal & Reiersen 2000).

The new Energy Act of 1991 alternated the industry from a regulated local monopoly to a deregulated and highly competitive national and international market. The monopoly was abandoned, and the consumers can now trade directly with the power producers (Mikkelsen, Nybø & Grønhaug 2002).

As a result of the competitive position after the deregulation in 1991, the electrical companies which earlier were rigid bureaucratic organisations, became highly dependent on their capacity to restructure in order to reduce operating costs, increase customer focus, and meet market demands. Productivity, customers and service were now brought into focus, and the deregulation arranged for custom-built solutions to meet demands in the market. After the deregulation a requirement for a third group of workers appeared, namely financial and marketing staff personnel (Mikkelsen, Landsbergis, Bakke, Gundersen & Jøsendal 2002).

The Norwegian government has traditionally played an important role in the Norwegian electric energy branch. The national energy policy has conventionally been concentrated on

⁴ Energilovutvalget

⁵ Statkraft SF is owned by the Government of Norway

hydroelectric power, at least until the start of the “oil age” in 1965 (Farsund 1998, 320). In the beginning of last century several watercourses were bought by foreign capital, and this aroused an interest in keeping the control of important natural resources on Norwegian hands. This led to an increased interest in national energy politics, and has ever since been an important political issue for both the government and the Parliament (Farsund 1998, 195). The government in particular has been an active participant in the expansion of the Norwegian energy system, and it has regulated the development in the sector through thorough legislation and tax structure. The government has had the control over the legislation, ownership of energy producers and –network, together with the economic means (Farsund 1998, 320).

Norway was early in the restructuring of this area, and when the preparation with the new Energy Act started, it was not deliberate that Norway would have one of the most liberal energy markets in Europe. In 1990 it was only England and Wales which had carried through a similar reform and it was not until the middle of the 1990s the other Nordic countries followed. The electric energy branch in Sweden and Finland were deregulated in 1996, and Denmark followed in 2000 (Leknes et al. 2000).

Up until the deregulation Max Weber’s ideal typical bureaucracy-model was distinctive for this business sector (Weber 1990). The sector was marked by the division of labour and a high degree of specialisation, and the focus on the customer was on a nearly non-existent level. The structure of authority was hierarchical with clearly stated areas of command and responsibility, and with strict formal rules to govern the operation of the organisation. In a monopolised and non-competitive situation, the focus and orientation was kept on engineering and technological part of the work, and the organisations in the energy branch were made of and for engineers. The labour force in the electric energy branch was split in two distinct groups; the manual workers and the office workers. Both these groups had engineering backgrounds, though the level and character of their education varied (Mikkelsen, Landsbergis, Bakke, Gundersen & Jøsendal 2002).

Parts of the Norwegian electric energy sector are still bureaucratic in its organisation, but with elements from less rigid organisational structures (Mikkelsen, Landsbergis et al. 2002). After the deregulation the energy industry was forced to change its primary focus from engineering aspects to a strong focus on quality, costs and service. In practise this meant increased

flexibility, more focus on efficiency and the customer. During the monopoly situation there was not a need for much contact between the customer and the deliverer. After the deregulation of the energy market the customer interface changed. When the customer can choose between several suppliers, the customer orientation and service becomes important. The roles are changed when the customer can make demands beyond a stable delivery of electricity. With high competition in the market, the focus on the customer is becoming even more important. Capabilities as a low-cost operation, active learning, innovation and customer sensitivity are seen as important as technical skills and general knowledge (Mikkelsen, Nybø et al. 2002).

Entry into the electricity market is still to some degree regulated by the Norwegian government. In accordance with the 1990 Energy Act, the Norwegian Water Resources and Energy Administration (NVE) issue permits for all companies which hope to produce, transmit or distribute energy.⁶ Such a permit is necessary for all companies that wish to be engaged in electricity supplies (Mikkelsen, Nybø et al. 2002).

The Norwegian electric energy branch have still some of their organisational solutions rooted in historical experiences and local traditions, while the branch is competitive so that energy can be sold independent of the physical place of production and the location of the consumer. One can therefore say that the Norwegian energy policy is, after the deregulation, by this, both traditional and modern in its form (Farsund 1998, 195).

The deregulation process

Even though the New Norwegian Energy Act became effective in January 1991, the process of carrying through the resolution took a long time. The Norwegian Water Resources and Energy Authorities (NVE) and the government introduced transitional provisions which regulated both income and costs for several years. Also the purchases, mergers and workforce reductions took time to actuate. The energy act amendment triggered much activity which is still in progress over twelve years after the energy act became effective. This can be illustrated by Statkraft's recent purchase of Agder Energi, a merger which was approved by the Minister of Labour and Government Administration in 2002.

⁶ Norges vassdrags- og energidirektorat

Yet another reason why the deregulation has been a lengthy process is the relation to the customers. NVE's transitional provisions also laid down limitations for the consumers, and controlled the relationship between the customers and the sector. The customers could in theory choose supplier as early as 1991, but it was not until 1997 this choice was extensively used by the consumers. One reason for this was the expense incurred by changing supplier. In 1991 the price for changing supplier was 5000 NOK per customer. In 1994 the prize sank to 4000 NOK.

Up until 1995 it was only possible to change supplier at the completion of a quarter (i.e. four times per year). It was not until 1995 the competition for the end users became real, because the local electricity plants established distinctive requirements for establishment of power measurement (requirement for hourly measurement) for customers who had another supplier than the local. The power suppliers had to pay an annual figure of 4000 NOK for each area they sold power. The cost for changing supplier was so high that household customers did not consider it interesting to change supplier until the requirement for hourly measurement lapsed in 1995. The actual market access for all end user became real when the charge for changing supplier was reduced to 246 NOK per customer in 1995. Still the owner of the net had the possibility to charge 4000 NOK from the new supplier.

In practice there was not real competition until 1997 when the charge of changing supplier (for both customer and supplier) was abandoned, and it was not until the same year that the Norwegian Competition Authority started to publish offers from different electricity companies, and NVE informed the consumers of the possibility of changing power supplier. As late as in 1998 the customers gained a weekly possibility to change supplier.

In the fall of 1998 over 90.000, or approximately 4% of all households in Norway, had chosen another supplier of electric energy than their local supplier. Entering the year 2000 approximately 160.000 (7%) of the Norwegian households made use of an energy supplier different from the dominating supplier in their region. In the case of the Norwegian industry, 16.3 %, or about 42.000 customers, had chosen a different supplier of electric energy than the dominating supplier in 1998 (Leknes, Opedal & Reiersen 2000).

Consequences of the deregulation

Leknes, Opedal and Reiersen (2000) report that there have been several internal consequences for the Norwegian electric energy companies as a result of the deregulation. The majority of the companies in Vesterålen and Ofoten had to carry through rationalisation actions as a result of income limits and demands for efficiency. The companies reported staff reduction, which resulted in more efficiency, but a lower level of activity. The deregulation has, besides this internal efficiency improvement, involved organisational changes in the companies. The internal changes involve a modernisation of administrative routines as a result of demands from NVE regarding reporting, measurement and online change of supplier. Other changes are specialisation, separation of parts of the organisational operations, mergers and centralisation (Leknes et al. 2000).

In *Exploring the Impact of Deregulation on Human Resource Management (HRM): the Case of the Norwegian Energy Sector* Mikkelsen, Nybø and Grønhaug (2002) present different organisational changes seen in the thirteen respondent organisations after the deregulation of the energy branch. The article shows that the deregulation in 1991 has had a considerable impact on the work organisation in the energy branch. The top managers from the thirteen companies which participated in the study were interviewed. They reported that several changes had occurred as a result of the new energy act, and that these changes were a result of more or less planned re-adjustments. Among other factors they all reported that restructuring and downsizing processes were carried out in the period after the deregulation (Mikkelsen, Landsbergis, Bakke, Gundersen & Jøsendal 2002). Some of the companies even reported several restructuring operations over the past decade since the new Energy Law came into effect. The larger companies of the thirteen studied were the first to implement new systems. Solutions chosen by these firms were often copied by smaller companies. New leaders and key personnel, who had studied economics in business schools, were recruited from the private sector. They were initiators for job redesign through new management ideas, competence systems and performance reward systems (Mikkelsen, Nybø et al. 2002).

Further the deregulation led to an increased relevance of operational knowledge. There arose a need to reduce the number of management levels, which were done in seven out of eleven electric energy companies in the study. The pressure on cost resulted in the dissolving of established work groups and putting together teams that represented the needed competence for doing specific job tasks. Instead of finding needed competence in the external labour

market, employees within the organisation were assigned to new tasks. A computer-based system of internal order blanks was introduced in the early 1990s, and orders were distributed and passed on to the employees electronically. The employees had to plan and organise their own work to a larger extent based on information collected from computers. Further as a result of the deregulation the employees went from training for a specific job to training for specific competence, which again created a need for computer technology competence. The competitiveness of the energy trade market also had an impact on the market structure. Four companies out of thirteen defined themselves as buyers of other companies, and five out of thirteen were in a situation in which they both were on the market to buy and also faced the possibility of being bought up (Mikkelsen, Nybø et al. 2002).

Restructuring strategies used often, involve improvement of product and service quality, redesign of work processes, obtaining a flexible production system, achieving cost reductions, and improving the employees' competence level. A focus on cost reduction became especially important after the deregulation. The industry had earlier operated in a setting with strong economy. The income level was high, and potential problems were solved by buying new equipment or recruiting more people into the defined problem area. When the market in the early 1990s was characterised by free competition, this strategy became too expensive, and other strategies were employed. Examples are early retirement, layoffs and downsizing. Eight out of twelve energy companies in the study reported that they offered early retirement. On the other hand; none of them had resorted to layoffs. To all the thirteen companies the major method of reducing cost was through downsizing (Mikkelsen, Nybø et al. 2002).

Ten out of eleven companies had improvement of product and service as a strategy. Ten out of thirteen reported a redesign of work. Ten out of eleven applied flexible production systems as a strategy in the organisational changes. And cost reduction was a main element in the strategy of nine out of twelve companies. An increase in the employees' competence level was reported by nine out of thirteen companies as part of their organisational changes. Even if a considerable amount of initiatives were actuated, and their impacts on the organisations were substantial, only a few of the manager informants reported that they had a clear vision of the future, or a plan for how to reach their goals. None of the companies based their restructuring on a special management concept, and they had no visionary picture of changes in the future. The changes which were made were based on different demands for structural

changes, productivity increase or cost reduction, and not according to long-time planning or a company's vision (Mikkelsen, Nybø et al. 2002).

Deregulation, restructuring and health

According to the interviews of managers reported above, several flexible strategies and organisational restructuring actions have been applied in Norwegian electrical energy companies after the implementation of the new Energy Act. The branch describes mergers, downsizing, cost reductions and other organisational changes as a result of the deregulation act of 1991; actions which are characteristic for the “new work”. But when the managers of the companies further report that the transformation actions were done *without* careful planning and coordination, and that the management had no visionary picture of changes in the future, one could assume unfavourable consequences for the workers in the branch.

III THEORETICAL APPROACH

WORK AND HEALTH

Norway has been a pioneer on the subject of work and health, and an interest for industrial and work issues has been established and developed in Norwegian research establishments since the Second World War. Much of the optimism and knowledge in this field was brought forward by Einar Thorsrud, a researcher and practitioner in Norwegian working life. Thorsrud and his colleagues initiated several work environmental research projects in the beginning of the 1960s and arranged for cooperation between employers and labour unions.⁷ The *Norwegian Law of Work Environment of 1977* integrated different principles from these projects, such as the *Psychological Job Demands* written by Thorsrud and Emery in the 1970s.⁸ The *Job Demands* emphasise that the employee has needs beyond getting paid, to be secure from injuries and the risk of losing their job. The job should also be interesting, a place to learn, to be respected and supported (Fischer & Sortland 1989).

There is an ongoing debate in Europe on how to retain or increase such goals of work quality as reforms and deregulations characterise the current organisations and labour markets (Benach, Gimeno & Benavides 2002). This section will present different changes in the organisation of work witnessed in the last decades, and briefly present some consequences these new types of employment might have on the workers health.

Psychological and physiological consequences of new types of employment

Jörg Flecker and Johanna Hofbauer (1998) have documented that a number of factors in the “new” type of work can be mentally straining to the employee. The workload is increased, and they are expected to take risky decisions. They experience stress, lack of time, increased job demands and decreased control. The concept of stress is consequently important when examining employee health and well being. According to Flecker and Hofbauer (1998) new forms of stress and strain occur as a result of the ambivalence within the flexible work organisation. They claim that a constant rotation of assignments and team composition and

⁷ The so-called “collaboration project” (“samarbeidsprosjektet”) of 1962 between the Norwegian Federation of Trade Unions (LO) and Confederation of Norwegian Business and Industry (former NAF) (Fischer & Sortland 1999).

⁸ Arbeidsmiljøloven of 1977.

the increasing workload as a result of this, may decrease the employees willingness to opt for flexible solutions and represent a risk to the employees health. It is no longer the physical aspects of the work day which are threatening to the workers health. Today it is the emotional and moral aspects of the employees' health and well being which are influenced.

The Tokyo Declaration, a consensus document produced by occupational health experts from the European Union, Japan and the United States, at a 1998 meeting at Tokyo Medical University, focuses on the health risks posed by these trends:

“organisational restructuring, mergers, acquisitions and downsizing, the frantic pace of work and life, the erosion of leisure time, and/or the blending of work and home time. Most of these developments are driven by economic and technological changes aiming at short-term productivity and profit gain to increase flexibility. This rapid change combined with both over and under-employment is likely to be highly stress provoking” (Landsbergis 2003: 62, *The Tokyo Declaration* 1998).

According to the Tokyo Declaration occupational stress-related mental and psychosomatic complaints are very common in all 15 European Union member states (Landsbergis 2003: 62, *The Tokyo Declaration* 1998). Surveys conducted by the *European Foundation for the Improvement of Living and Working Conditions* between 1977 and the middle of the 1990s also report some of the changes in work organisation and their effects (Landsbergis, Schnall & Cahill 1999). The surveys give evidence for a number of potential pathways through which these new types of employment might damage health. *The European Foundation for the Improvement of Living and Working Conditions* points out the similarities between the new forms of work organisation and flexible employment and unemployment. There is evidence that unemployment is strongly associated with morbidity, harmful lifestyles and reduced quality of life. It might therefore be plausible that the “new” flexible trends in organisations also have a negative effect on health (Benach, Gimeno & Benavides 2002).

The European Foundation shows the tendency of increased use of different types of flexible employment seen in recent years. According to the Foundation these types of employment had a worse impact than more standard types of employment. They claim that the probability to experience job dissatisfaction and other health indicators increase for those with non-permanent jobs than for those with permanent employment. The workers with non-permanent jobs are exposed to more hazardous or dangerous work environment and reports

show much higher levels of occupational accidents as compared to permanent workers. They also work in more tiring and painful positions, they are trapped with repetitive tasks and are more exposed to noise. In addition, non-permanent workers also have greater demands and lower control over the work process, in addition to low rewards – all of which have been associated with adverse health outcomes (Benach et al. 2002).

Others have reported similar findings over the last few years. *The International Labour Office* (ILO) show a tendency amongst the countries studied for high stress, burnout and depression as a result of the changes taking place in the labour market (Landsbergis et al. 1999). Tregaskis, Brewster, Mayne and Hegewisch (1998) report similar negative implications of flexible work arrangements on stress, motivation, job insecurity, corporate culture and the relationship between employer and employee. Landsbergis, Schnall and Cahill (1999) also claim it is reason to believe that changes in work organisation may affect job characteristics, job stress and health in a negative way.

There are other examples of both physical and psychological harm to employees as a result of work conditions. Long-term consequences may be expressed in psychological dysfunctioning like burnout and depression. Physiological consequences might be psychosomatic diseases, stomach and intestinal disorders, cardiovascular diseases, and musculoskeletal problems. A natural consequence of psychological or physiological dysfunctioning is sickness, absenteeism and work disablement (Karasek & Theorell 1990).

Gründemann, Nijboer and Schellart (1991) showed that 58 % of all Dutch employees who were medically disabled for work for reasons of psychological dysfunctioning, state that their psychosocial workload was responsible for their disease. 35 % of those who were medically disabled for work had cardiovascular diseases, 10 % had musculoskeletal problems. In 44 % of the cases of those with the diagnosis “psychological dysfunctioning”, e.g. fatigue, depression or burnout, psychosocial workload played an important causal role. 35 % of those who were disabled claimed that they still would be employed if preventive action were taken on an early stage. This might indicate that work stress and strain may cause health problems, but that it is possible to prevent the problems (de Jonge & Kompier 1997).

Downsizing, which is another flexible solution, may also have unintended consequences. Expected benefits are factors such as decreased bureaucracy, faster decision making, increased

productivity and better earnings (Kets de Vries & Balazs 1997), and the actual effects can according to Irving Palm be increased engagement and participation, new inventions, increased solidarity, cost saving, increased productivity, less bureaucracy, faster decision-making and more flexible communication. Negative effects, on the other hand, are increased work load and stress, insecurity for the future, decreased motivation and engagement, increased bureaucracy and centralisation and reduced opportunity for long-term planning. By cutting back on number of employees the organisations can create resentment and resistance. Many companies therefore experience problems with morale, trust and productivity from their employees (Färm 2000).

This is also reported by the *European Foundation for the Improvement of Living and Working Conditions*, which claims a linear relation between downsizing and long periods of sick leave. One study from 1987 showed that perceived job insecurity was the single most important indicator of a number of psychological symptoms, such as mild depression (Benach et al. 2002). Further it is proven that white-collar employees reported a deteriorating health status if they anticipated job change or job loss in the immediate future. Stable organisations, in contrast, score well on demands, incentive and influence. Even the physiological parameters shows that the employees in stable organisations have better health, and run a smaller risk for cardiac diseases (Benach et al. 2002). Töres Theorell further claims that the problem with the change-over to lean production is not necessarily the *actual* change-over, but *how* it is carried out. If the reorganisation is not properly planned and carried through, downsizing will often result in increased job insecurity, and therefore increased health risk for the employees (Färm 2000).

According to Robert Karasek and Töres Theorell (1990) the “cure” lies in the transformation of the workplace, with an attention to psychological and social aspects of work. Employees report no harm on their well-being as long as there is a positive change in the work characteristics. They report that limited psychological demands of work, along with time pressures and conflicts, are not a major source of risk to health. The primary work-related risks with a demanding job appears to be lack of control over how one meets the job demands and how one uses one’s skills. An elevation of risk with a demanding job appears only when these demands occurs in interaction with low control on the job. So it is not the demands of work itself, but the organisational structure of work that plays the most consistent role in the development of stress-related illness (Karasek & Theorell 1990). The relationship between demands, control and health will be examined further in the following section.

THE PSYCHOSOCIAL WORK ENVIRONMENT

Further in the thesis I will try to understand and explain the relationship between the changes in working life and subjective health, through the multidisciplinary model on *psychological job demands* and *job control*. This section will present concepts which are basic for understanding and using these theories. The dimensions in the *job content's* concept; *demand*, *control* and *social support* will be presented. Then a presentation of *occupational health*; in terms of *job stress*, *job satisfaction*, *subjective health complaints* and *sick leave* will be outlined.

Job content

Psychological and physical job demands

Karasek and Theorell (1990) discriminate between *physical demands* and *psychological demands* of work. Physical exertion on the job may involve working in awkward positions, muscle loads, noise, heat, dust, exposure to toxic substances, risk of burn or shock or general dangerous work methods. The consequences of being exposed to different physical demands vary from cardiovascular diseases to musculoskeletal disorders. Even though physical demands still are important to as many workers as psychological demands, there has been an increase and a shift in focus towards psychological demands. The psychological burdens of the work task can come from different sources, such as deadlines, physical exertion, work conflicts or the mental stimulation necessary to accomplish a task. Even though there are several types of demands, “work load” is the most common demand for the majority of workers (Karasek & Theorell 1990).

When the focus in an organisation earlier was on knowledge of core tasks, customer relations are now gaining more attention. For organisations to be service minded, personal qualities such as punctuality, loyalty, creativity and customer orientation are becoming more important traits. Competence planning and evaluation, collaboration with management, feedback mechanisms are characteristics that are of considerable weight in a deregulated market. Employees have to be able to integrate various tasks they are assigned to perform both on their own and in conjunction with others. This assumes good cooperation with people of another gender, with another educational level and profession (Mikkelsen, Nybø & Grønhaug 2002).

Worker control

Control is a crucial moderating variable that determines whether the positive learning consequences or negative strain consequences would accompany different job demands (Karasek & Theorell 1990). According to Daniel C. Ganster (1989), control can be defined as “the ability to exert some influence over one’s environment so that the environment becomes more rewarding or less threatening”. Karasek and Theorell (1990) have a similar definition, and define control as “the worker’s potential control over his tasks and his conduct during the working day”. So if the worker’s skill is being utilised and developed, the worker is more likely to feel in control of the many different situations that may arise (Karasek & Theorell 1990).

Control has received relatively little attention in the “life stress” research tradition. Literature from the mid-1970s showed that the major focus on work stress was based on the psychological demands of work alone, and therefore little on control at the workplace (Karasek & Theorell 1990: 38). Even though the concept of control has gained little attention, it has been important for many theoretical and practical contributions in the history of work research. F. W. Taylor in *Scientific Management*, for example, rationalised work by decreasing the employees’ control or decision latitude.⁹ The employee should be a human robot, and let all decision-making and thinking be in the hands of the management (Agervold 1998). Control over own working situation and participation is today considered to be important for coping the possibilities of the employees, and outranges other traditional psychosocial factors (Karasek & Theorell 1990).

It is possible to distinguish between the *objective presence of control* (instrumentality) and the *individual’s perception of control* (perceived control) (Ganster 1989). When control can be defined independently of the employee’s own perceptions it is said to be “objective”. *Objective control* can be measured by categorising different occupations, while *perceived control* is measured by e.g. questionnaires which capture the individual’s own perception of control in their work situation.

⁹ Scientific Management: a movement from the early twentieth century where it’s main advocate F. W. Taylor attempted to transform the administration of the workplace to increase profitability. Important moves were greater division of labour, full managerial control and time- and motion studies to cut costs (Abercrombie, Hill & Turner 1994).

Decision latitude is interpreted as the employees' "ability to control his or hers own activities and skill usage" (Karasek & Theorell 1990). Karasek and Theorell (1990) use the concept of *decision latitude* synonymous with *worker control*. Decision latitude in their Demand/Control Model consists of two sub dimensions; a combination of decision authority and skill discretion. *Skills discretion* is the level of task variety the employee experience at work. Aspects such as learning opportunities, opportunity to use own skills and task variety are examples of skill discretion. *Decision authority* is freedom to plan and organise own work, freedom to take breaks when needed and freedom to decide what to do and how to do the work (Karasek & Theorell 1990).

Lazarus (1966) shows how the possibilities of control can play a role in the different stages of the stress process. The opportunity of control can both prevent and counteract a potential stressful situation, because perceived subjective control influences the interpretation of different situations. The motivation may increase simultaneously with increased task responsibility, so that the employees control over their own working situation will have a health promoting effect. With increased degree of direct participation and more power to influence own work day the level of employee control are increased. Where the employee can influence and control the planning, organisation and adjustment of the work tasks, there are great chances for the employee to develop competence and manage the demands in work and co-operation. When they don't have the opportunity to influence and control their own work situation, they run a risk of developing illness and nervous breakdowns. Sometimes unexpected work demands and situations arise, which may challenge established coping strategies and create stress and anxiety. Karasek claims that situations with high psychological demands and low decision latitude cause the individual to "pile up tension". The collection of energy and the "state of readiness" as a bodily reaction to the unexpected may in the long run create negative health consequences (Karasek & Theorell 1990). Amongst others, Karasek and Theorell (1990) claim there are substantial evidence for a correlation between psychological job demands experienced at work and health consequences reported by workers.

Social support

Social support has been one of the most recurring themes in stress-management literature ever since the Hawthorn experiments in the 1920s, which marked a shift away from the Scientific Management view. The Hawthorn experiments at the Western Electrics plant

showed how social relations and group dynamics with co-workers and supervisors are a central determinant of productivity (Kreitner, Kinicki & Buelens 1999).¹⁰

According to Karasek and Theorell (1990) *social support* at work refers to overall levels of helpful social interaction available on the job from both co-workers and supervisors. There are different kinds of social support. Two examples are *emotional* support and *instrumental* support. Emotional social support are understanding, contact and motivating actions coming from colleagues, family or other people which buffer psychological strain. At the workplace this kind of support can be measured or observed as trust, communication and dialogue. Instrumental social support is the extra resources or assistance the employees receive from co-workers or supervisors to carry out work tasks (Karasek & Theorell 1990: 71).

According to Karasek and Theorell (1990) there are three mechanisms by which social support at work might affect well-being. The first mechanism is that social support can function as a buffer between psychological stressors at work and negative health outcomes. Further, social contact and social structure affect the basic physiological processes important to promote health and the acquisition of new knowledge. A third mechanism of social support is that it can facilitate active coping patterns in contrast to passive coping and withdrawal from social settings. These patterns not only affect health through second-order effects, but also productive behaviour. According to Karasek and Theorell there might be a fourth mechanism to social support. This fourth mechanism is that social support gives a sense of identity through a socially confirmed value of the individual's contribution to the collective goals and well being (Karasek & Theorell 1990: 70).

Many studies have focused on how social support relations on the job affect psychosocial health (Cohen & Syme 1985, House 1981, Johnson 1986, Karasek & Theorell 1990). Social support is generally associated with dramatically lower levels of depression, burnout, anxiety and cardiovascular diseases in the combined female and male populations. Several studies have documented that social support also is one of the most important moderator of people's reactions to stressors (Mitchell & Larson 1987).

¹⁰ Sverre Lysgaard (1961) also shows social support's important role for productivity and interaction in his book *Arbeiderkollektivet*. In this study Lysgaard shows how group interplay is the main defence against management pressure, and how being a good colleague is more important than being a good employee. He also shows how insecurity, lack of decision latitude and increased work load may explain the feeling of solidarity amongst workers against the company management.

Since social support is of such importance to employees' health it was included as a third variable in the Demand/Control Model by J. V. Johnson in 1986 (Johnson 1986, Karasek & Theorell 1990).

Occupational health

Job stress and coping

Stress is a complex construct. There are several causes of multiple psychological and physiological states, and with an array of outcomes (Mitchell & Larson 1987). There is a tendency of considering all organisational phenomena as stressors, or as stress provoking factors. Relations, physical environment, careerism, roles, organisational structure, and processes of change are examples of potential stressors in an organisation (Hellesøy 1990).

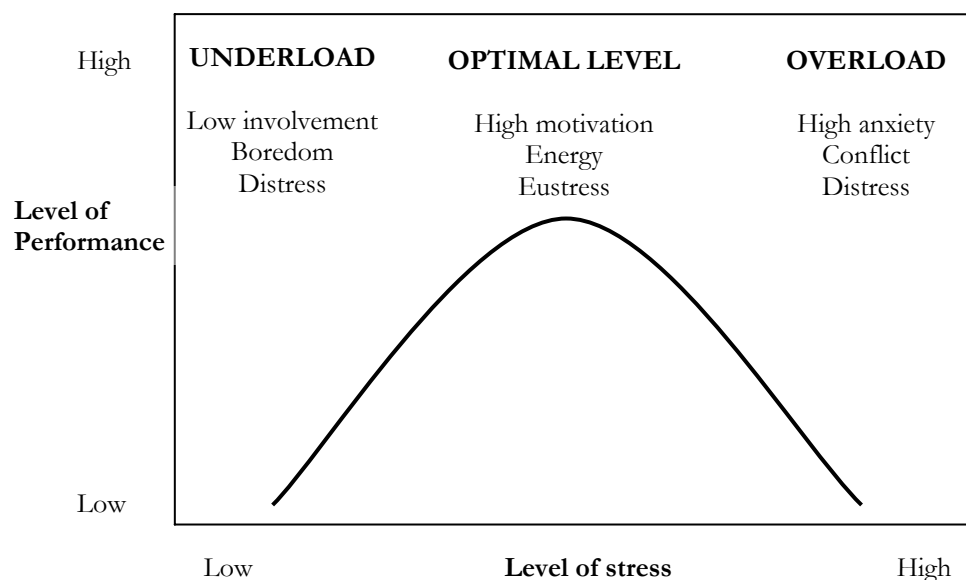
Peggy A. Thoits (1995) refers to a definition of “stress” or “stressor” presented by Thomas H. Holmes and Rickard H. Rahe in 1967. According to them “stress” or “stressor” are any “environmental, social, or internal demand which requires the individual to readjust his or hers usual behaviour patterns” (Thoits 1995: 54). According to Hellesøy (1990) stress can both be something positive (possibilities) and something negative (demands).

When a person perceives demands the result can be a “stress reaction”, which is a state of physiological or emotional arousal (Thoits 1995: 54). Stressors can accumulate and the individuals' abilities to cope or readjust can be overtaxed, and this can increase the possibility of becoming ill or injured, or suffering from psychological distresses (Thoits 1995). Stress or strain is a result of the disparity between the individual and its resources, and demands from the environment or from the individual itself (Levine & Ursin 1991). This disparity, or stress, sums up over time and can be transferred between different situations and arenas (Hellesøy 1990). The individual will try cope by *avoiding*, *adapting* or *taking advantage* of the stressors. When the person recognises that there is no possibility of being able to adapt to the imbalance, or disparity, stress occurs (Mitchell & Larson 1987).

It was Hans Selye (1956) who first really promoted the concept of stress-related illnesses in his identification of stress as “the body's non-specific response to any demand that is placed on it, whether that demand is pleasant or not” (Thompson & McHugh 2002). According to Selye (1956) a certain amount of stress can be good to the individual, but *too* much stress can

result in pathology. The model below shows the two main forms of stress detected by Selye in the 1930s.

Fig 3. *Different stress and performance levels*



Distress, or strain, is the negative form of stress. While *eustress* is the healthy, normal stress that leads to positive feelings and possibly to what have been termed “peak experiences”. These forms of stress are positive and negative consequences of *arousal*, or the level of drive or motivation put into a task (Yerkes & Dodson 1908). But the level where stress switches from good to bad is not specified in Selye’s theory, and one can only determine that stress is too much only if it produces bad consequences (Thompson & McHugh 2002).

Stress can be expressed differently by different persons. The physiological reactions can be increased heart activity, increased adrenaline flow, headache and pain in muscles or stomach. Psychological reactions to stress have both an emotional and cognitive side to it. Emotionally we have anxiety, irritability and discontent. Examples of behavioural reactions and cognitive issues to stress can be difficulties in concentrating, lack of memory, less engagement in work tasks, increased sick leave and withdrawing socially from co-workers (Kaufmann & Kaufmann 1998: 87).

Some situations of strain can’t be solved by using existing adaptive response patterns. The process of coping is any attempt to counter such situations (Hellesøy 1990). Lazarus and Folkman define coping as “the constant shifting cognitive or behavioural efforts to handle

specific external or internal demands, which are perceived as straining or exceeds the person's resources" (Lazarus & Folkman 1984).

When being exposed to stressors the individual undertakes an evaluation of the actual situation, and chooses the most suitable strategy. If a strategy proves to be effective in dealing with stressors, the strategy is embodied in the individuals' coping repertoire. When the individual experiences coping as an opportunity, he or she feels in control over the situation. The employee's experience of coping and the expansion of coping skills are perceived as an increase in competence and self esteem. The coping process is accumulating, because higher self esteem gives motivation for new assignments which increases coping skills, which again leads to higher self esteem (Lazarus & Folkman 1984).

Job satisfaction

A general description of job satisfaction is the degree to which the person is satisfied with his or her job and job situation. Job satisfaction is by this definition the individual's own affective and cognitive evaluation and different reactions to their job situation. An employee is content at work when his or her needs are satisfied, motives are achieved and goals are met (Hellesøy 1990). According to Locke and Henne (1986) a more specific definition could be "the pleasant emotional state which flows from someone realizing his/her motives (values) in the work". Job satisfaction may be affected by aspects as job characteristics (job demands and job control), management, social support, physical working conditions and reward systems (Kaufmann & Kaufmann 1998).

Sick leave and subjective health complaints

Sick leave is a multicausal phenomenon, but it is a common presumption that the work environment influence on sick leave. Work environment can be divided into two; the physical and the psycho-social work environment. Physical factors may be dust, noise, ergonomic structures and risk for physical damage. Psycho-social factors may be work organisation, work arrangements and inter-human relationships (Hansen 1999).

The most frequent causes behind the high numbers of days taken as sick leave appear to be related to musculoskeletal pain, pseudoneurological symptoms such as tiredness, depression, fatigue, headaches, sleep disturbance or concentration problems. These are subjective health complaints with little or no objective findings, and they only qualify for a medical diagnosis

when they are very intense and long lasting (Ursin 1997). It is therefore important to look for moderators for the relationship between work load and ill health. It is documented that for instance job control, worker autonomy, participation in decision making and social support function as moderators against stress and strain (Karasek & Theorell 1990), as I will explain in a later paragraph.

Organisations have large expenses on sick leave. The total costs for the Norwegian government was in 1995 20 billion NOK. On average in 2000 each employee had 25 days away from work as a result of illness. Absence because of sickness was about 8.1 % in 2003. Of this 1 percentage is self-certified short termed absence, while 7 percent is doctor – registered absence (SSB 2003). Subjective reported health complaints accounts for almost 50% of all work days lost due to sick leave in Norway (Kaufmann & Kaufmann 1998: 35). The Norwegian authorities expressed in the early 1990s a wish for change in the sick pay scheme to save public expenses. As a result a national project to reduce sick leave was started by *The Norwegian Federation of Trade Unions* (LO) and *Confederation of Norwegian Business and Industry* (NHO) in deliberation with the Norwegian government (Andersen 1998).

In 1998 almost 5 % of the employees aged between 16 and 66 years in Norway reported difficulties in coping with their work situation as a result of health complaints. 17 % of employees (or former employees) aged between 16 and 66 reported that their health problem was a consequence of their work situation (or former work situation). The dominating complaints reported in the employed Norwegian population were musculoskeletal illness, back and neck pain and arthritis (SSB 2003).

Surveys have showed that organisations primarily focus on the physiological and technical aspects of the work environment. However it was the initiatives directed towards *stress*, *work load* and the *social aspects* of technology, which gave an actual reduction in sick leave. This implies that reduction in sick leave first and foremost presupposes initiatives in the organisational work environment. The organisations participating in the survey experienced improved worker health and reduced sick leave, without a reduction in productivity. This was achieved through increasing workers' coping skills, control and decisive influence, while reducing stress and strain (Andersen 1998).

It is a combination of all the above-mentioned concepts which determine how employees perceive their work day. Robert Karasek and Töres Theorell combine two of the concepts, demand and control, to illustrate organisational dynamics in their Demand/Control Model.

THE DEMAND/CONTROL MODEL

This section will present the Demand/Control Model, and the four different kinds of psychosocial work experiences which are generated in the model. Further I will show how learning is related to the Demand/Control Model, and present empirical evidence and critique of the model.

“Psychological fallacy”

Paul Thompson and David McHugh (2002) describe the “psychological fallacy” in their book *Work Organisations*. This fallacy implies individual-centred methods to alter conditions for both the individual and the organisation (Thompson & McHugh 2002: 285). The thought is that since the organisation is made up of individuals the organisation could be changed by changing its members (Katz & Kahn 1978).

From the 1950s to the late 1970s there was a great theoretical development in the field of job stress and job design. Two important models from this period came from the United States; Herzberg’s *Motivation-hygiene Theory* and Hackman and Oldhams (1976) *Job Characteristics Model*. They were both concerned with the design of individual jobs, but Hackman and Oldhams *Job Characteristics Model* from 1976 proved to be the most stable one (Parker & Wall 1998: 9). Hackman and Oldhams model focus on job characteristics and autonomy. They identified five “core job characteristics” which relate to the motivation and satisfaction of employees, namely “skill variety”, “task identity”, “task significance”, “autonomy” and “feedback from the job” (Parker & Wall 1998). According to this model the changes in job design results in an increased autonomy, motivation, job satisfaction and commitment. The model has, however, no focus on workers health. One model of stress which goes beyond the individual level approaches and account for perceived levels of control, is Robert Karasek and Töres Theorell’s *Demand/Control Model*. This model links occupational health variables to dimensions of demand from the situation, and the level of control; autonomy available to the individual in the workplace (Karasek & Theorell 1990).

The Demand/Control model

Inspired by the *Job Characteristic Model* and organisational learning theory the *psychological job demand and decision latitude model* was first developed and presented in 1979 by Robert Karasek. The intention behind the model was to create an analysing tool for use in organisational development, to prevent and modify job stress and stress related illness, which should be both simple and educational (Karasek & Theorell 1990).¹¹

In the book *Healthy Work: Stress, Productivity, and the Reconstruction of Working Life* (1990) Robert Karasek and Töres Theorell elaborated and refined the Demand/Control Model. Karasek and Theorell used data on job characteristics from the national *Quality of Employment Surveys* collected by the U.S. and Swedish Department of Labour to verify their model. They identified occupations with desirable and undesirable psychosocial job characteristics associated with different levels of health risks from studying these data collections (Karasek & Theorell 1990).

The main concepts in the model are *psychological job demands* and *decision latitude* or *worker control*, and later on, *social support* was added by J. V. Johnson (1986). The model specifies conditions that determine when work conditions will result in good or bad health. It is the individual's level of control over the work situation that is decisive in situations with high workloads or demands. The Demand/Control Model shows how the work situation affects the employees' health and well-being, and how management and employees together can influence the most important organisational factors as quantitative demands, decision authority, learning opportunities and use of skills (Karasek & Theorell 1990).

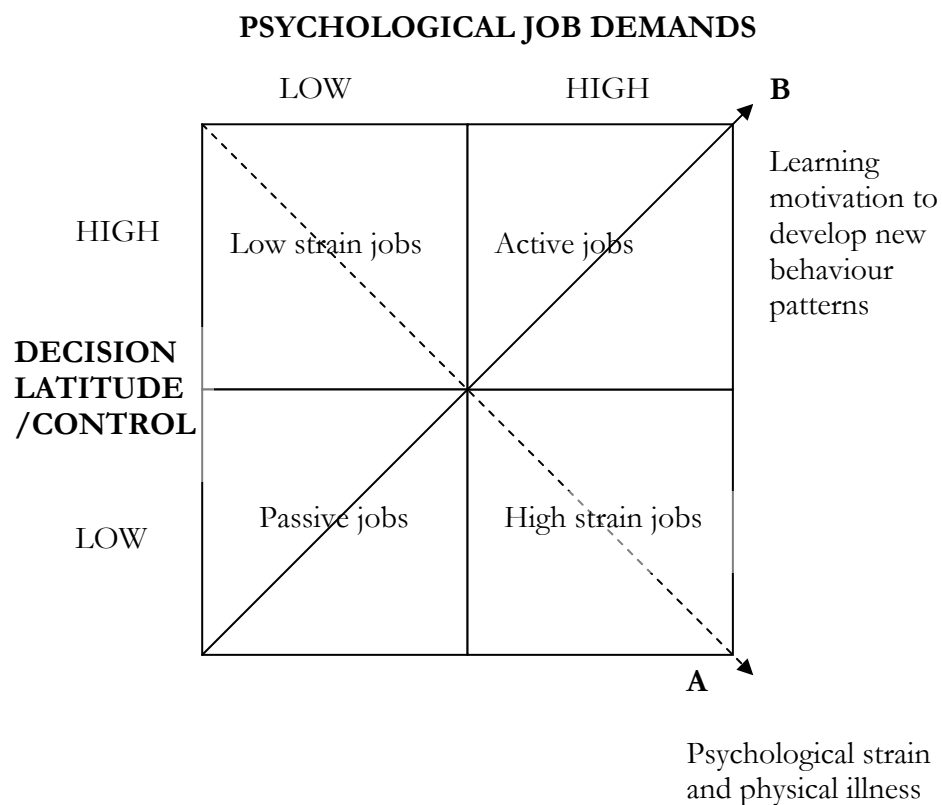
Job demands, decision authority, skill discretion and task control, predict, according to Karasek & Theorell (1990), a broad range of health and behavioural consequences as cardiovascular diseases, depression, musculoskeletal diseases, anxiety, job satisfaction and job commitment (Karasek & Theorell 1990: 31). These factors are together with social support the best determinants of occupational health. During reorganisation these factors should be improved according to Mikkelsen, Nybø and Grønhaug (2002).

¹¹ Dement's (1969) animal observations inspired the development of the Demand/Control Model. Dement observed animals, and concluded that REM sleep was inhibited if they were placed on a treadmill, an action similar stressfull to those of assembly-line workers. Another finding by Meisner (1971) showed that demanding job situations involving high levels of control encouraged to competence building outside of work. The same tendency of carryover effect of job responsibility to an active leisure was observed by Kohn and Schooler (1973, 1982).

Karasek and Theorell's model is different from the earlier and additive linear models, which claim that *more* strain involve *more* health damage (Ebeltoft 1990). Literature reviews of industrial sociology, industrial psychology and epidemiology shows that a large part of previous research is based on psychological demands of work alone, with little mention of control on the workplace. In their model Karasek and Theorell focus on interactivity in the work environment, and the model permits an interplay and alternation between the work demands and the employees (Karasek & Theorell 1990).

Demands are necessary for effective learning, but are also clear contributors to psychological strain. To determine whether the consequences will be positive (learning) or negative (strain), control becomes an important moderating variable. The model presupposes that the employees have the freedom to face the strain and knows the countermeasures to the psychological job demands. And it shows different states of the combination of high/low demands and high/low decision latitude (Karasek & Theorell 1990: 40).

Fig 4. *The relationship between psychological job demands and control*



The Demand/Control Model is based on two central assumptions, reflected by diagonals A and B in Figure 4. The first assumption (diagonal A) is that psychological strains are caused by high psychological demands and low decision latitude, and is constituted by low strain and high strain jobs. Karasek and Theorell stated that such a combination can be described as an interactive effect. The effect job demands have on health and well-being varies according to the amount of decision latitude that the job provides. The second assumption (diagonal B) is that work motivation as well as learning and development opportunities will occur if both the job demands and decision latitude are high. The active and passive jobs, taken together, trace diagonal B in the figure (Karasek & Theorell 1990: 38).

Four distinctly different kinds of psychosocial work experience are generated by the interactions of high and low levels of psychological demands and decision latitude; *high strain jobs*, *active jobs*, *low strain jobs* and *passive jobs* (Karasek & Theorell 1990: 31). These four situations, which are combinations of high and low job decisions latitude and psychological demands, illuminate the importance of psychological demands and decision latitude in predicting health and behaviour (Karasek & Theorell 1990).

High strain jobs

The first prediction in Karasek and Theorell's model is that the most undesirable reactions of psychological strain such as depression, anxiety and physical illness, occurs when the psychological demands of the job are high and the worker's decision latitude in the task is low. This category is called *high strain jobs*, and is placed in the lower right-hand cell in the model (Karasek & Theorell 1990).

When workers experience job situations with high demands combined with a low control over environmental circumstances, the response is psychological strain. This arousal energy is transformed into damaging, unused residual strain, which can lead to physical and psychological damage. According to Karasek and Theorell there are still high levels of strain in jobs in the modern world, but in less acute form. One example of high strain jobs are assembly-line jobs. Assembly-line workers behaviour is rigidly constrained. If the line is speeded up and the workers are expected to perform more, the arousal level consequently ascends. If the pace is kept up and long-lasting and the worker's control over the situation is non-present, the arousal will be transformed to psychological and physical strain (Karasek & Theorell 1990: 33). The same reactions are seen in Whyte's (1948) classic study of restaurant

workers. He describes waitresses who often experience heavy pressure and work load, for example, during lunchtime. Since the waitresses can't control their customers, and if they have no possibility of letting off steam on their co-workers, they experience a high strain situation according to the model.

Karasek and Theorell claim that responses to high strain situations can go beyond arousal to psychological strain, and in the long term, to stress-related illnesses such as heart disease (Karasek & Theorell 1990: 34). Unintended outcomes may occur depending on the severity of the requirements. Low-level stressors can cause simple symptoms as fatigue, whereas long-time and high strain situations can lead to personal breakdowns.

Active jobs

The second prediction in the model is that *active jobs*, with high control and high psychological demands, also have a high degree of learning and growth, which are conducive to high productivity. Active jobs are found in the upper right-hand corner of the figure, and although these jobs are high in demand they don't cause negative psychological strain (Karasek & Theorell 1990).

Examples of active jobs are surgeons performing difficult operations or professional athletes who compete against their hardest opponents. Active jobs situations are intensely demanding, and involve activities in which the worker feels a large measure of control. Together with a high level of control, the worker has the freedom to use all available skills. Karasek and Theorell call this kind of job *active jobs* because research in both Swedish and American populations has shown this group of workers, in spite of heavy work demands, to be the most active in leisure and popular activity outside of work (Karasek & Theorell 1990: 35).

Karasek and Theorell claim that these jobs result in positive psychological outcomes such as learning and growth, which both are conducive to high productivity. The energy aroused by the active job is translated into action through, for instance, effective problem-solving. This way, the amount of residual strain to cause disturbance is kept on an average level. When the worker has the freedom to decide the most effective course of action in response to a stressor, he or she can test the efficacy of the chosen course of action, and then reinforce it if it has worked or modify it if it has failed (Karasek & Theorell 1990: 36).

Psychologically demanding work is associated with more active leisure, rather than less active leisure. There are findings from Sweden which indicates that active job situation with high psychological demand and high decision latitude is associated with high rates of participation in socially active leisure and political activities. Passive workers do not compensate for passive jobs with active leisure but instead appear to carry over social patterns of behaviour from work to leisure (Karasek & Theorell 1990).

Low strain jobs

Low strain jobs are found in the upper left-hand quadrant of the model, and represent the third prediction in Karasek and Theorell's model. The third prediction is that high degree of decision latitude combined with few demands and challenges, creates a lower than average levels of residual psychological strain. This low-strain job category represents the other end of the residual psychological strain diagonal, labelled A. Examples of low strain jobs are repair personnel, carpenters, machinists or architects. Low strain workers have a work situation with a low stress level, and are happier and healthier than average at work (Karasek & Theorell 1990).

Passive jobs

The last cell in the figure represents situations which are low on demand and low on control, which are called *passive jobs* in a work context. The passive job setting is the second major psychosocial work problem which, according to Karasek and Theorell, can be described in the model. If compared to high strain jobs, passive jobs can result in different injuries on health and involve different strategies for eliminating injuries. Janitors, dispatchers and miners are examples of passive occupations (Karasek & Theorell 1990: 43).

Karasek and Theorell claim that passive jobs which lack job challenges, can lead to negative learning or gradual loss of previously acquired skills. A passive work situation can influence workers leisure activities outside the job in a negative way. Environmentally rigid restrictions preventing workers from testing their own ideas for improving the work process can only mean an extremely unmotivating job setting and result in long-term loss of work and productivity (Karasek & Theorell 1990: 38).

For passive jobs, like for active work, Karasek and Theorell hypothesise only an average level of psychological strain and illness risk. Even though each stressor exposure would result in

substantial residual psychological strain, the low demands of this work situation mean that fewer stressors are confronted (Karasek & Theorell 1990: 38).

The Demand/Control Model and learning

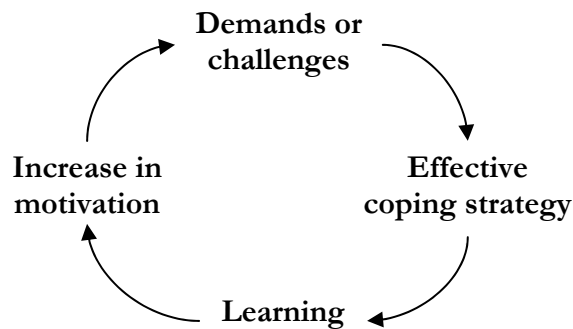
The changes in demands can be perceived as both negative and positive for an employee, since demands can be a clear contributor to psychological strain, but also is necessary for effective learning. Work demands can be interpreted as burdens to the individual, but also represent challenges and opportunities for growth and learning. Diagonal B represents the second hypothesis in the Demand/Control Model, which proposes that high demands in the work situation combined with high control increases the probability of learning, and motivation to develop new behaviour patterns. According to the model learning is important to workers health (Karasek & Theorell 1990).

Work motivation theories and the active learning hypothesis

Robert Karasek and Töres Theorell's define learning through their Demand/Control Model as something that "occurs in situations that require both demands or challenges and the exercise of decision-making capability" (Karasek & Theorell 1990: 92). When the individual copes with a new stressor, and the result is effective, this will be incorporated into his or hers range of coping strategies, and learning has occurred. With a growing range of coping strategies the individual can risk more and therefore attain more, and in this way increase his motivation for new tasks and new learning.

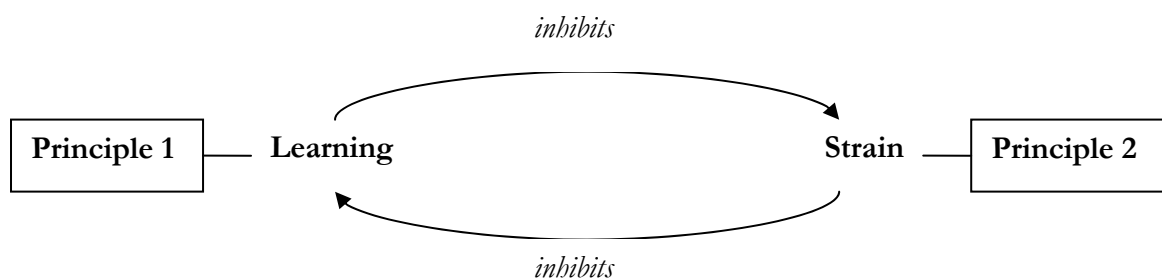
Karasek and Theorell define motivation as an "environmentally facilitated, active approach toward learning new behaviour patterns or solving new problems" (Karasek & Theorell 1990: 92). So the mechanism is positively accumulating as new coping strategies raise the individual's self-esteem, which raises the motivation to meet challenges, which again leads to new coping strategies or learning (see Fig. 5).

Fig 5. *The relation between demands, coping, learning and motivation*



Karasek and Theorell (1990) derive the *active learning hypothesis* from their Demand/Control Model. According to them an increase in learning will occur when the challenges in the situation are matched by the individual's control over alternatives or skills in dealing with challenges or demands. This represents the second assumption in the Demand/Control Model, where demands and control are high (upper right corner in Figure 4). But learning will only occur in situations that are challenging enough to be interesting, but not so demanding that capacities are overwhelmed (Karasek & Theorell 1990: 171). The Demand/Control Model predicts both learning and stress consequences from two different combinations of demand and control, or two principles of disequilibrium, as illustrated in Figure 6.

Fig 6. *Two principles for strain and learning*



The first principle is that increased skills allow the system to face its challenges with less effort. In this way *learning inhibits strain*. The second principle is that systems in a state of strain have little capacity to learn, so *strain inhibits learning*. Too high levels of stress may inhibit

learning, but on the other hand, job induced learning might reduce the stress response through development of confidence and self-esteem (Karasek & Theorell 1990).

Having decision latitude over the work process will reduce an employee's stress level, but increase learning, while psychological demands will both increase learning and increase stress. In this way the Demand/Control Model holds an *asymmetrical relation*. Passive situations can appear in many jobs and are a combination of low level of both demands and control. When the acceptable range of demands is so narrow, stressor-free periods can also lead to uneasiness and anxiety. Situations where demands and control are low are according to Karasek and Theorell associated with unlearning and loss of skills (Karasek & Theorell 1990: 92).

Learning in changing organisations

Even though learning is important to Robert Karasek and Töres Theorell they do not describe the interaction between individual and organisational learning within their model. Organisational learning theories can therefore be seen as complementing the Demand/Control Model (Karasek & Theorell 1990).

The idea of *organisational learning* has become more and more relevant in recent years as organisations have felt a need to meet and adapt to the changing environments (Argyris & Schön 1996).¹² With an increasing global economy and market competition, businesses, firms and institutions also need to change fast. According to work design theory, learning and development can be an outcome of job restructuring, as changes in technologies and work organisation imply a learning process for the individual, the group and the organisation (Parker & Wall 1998).

When the environment changes in an organisation, new learning has to be institutionalized into new routines and procedures. It takes time to transfer learning from an individual level

¹² Organisational learning was introduced as a concept by V. E. Cangelosi and W. R. Dill (1965) over 30 years ago, but was welcomed with scepticism. Much of the reason for the scepticism against organisational learning was the question of how an *organisation* could learn when it is the *individuals* that learn, reason, think and hold opinions (Argyris & Schön 1996: 4). If organisations are made up of individuals, it would be natural to think that it is *them* who hold the knowledge and information, and that organisational learning is the sum of each member's learning. Crossan, Lane and White (1999: 522) define organisational learning as "principal means of achieving the strategic renewal of an enterprise", so if renewal is to be seen as strategic, it has to involve the whole organisation. In their article Crossan et al. see strategic renewal as the underlying phenomena of interest when discussing organisational learning, as renewal requires the organisation to "explore and learn new ways while concurrently exploiting what they already learned" (Crossan et al. 1999: 522). The concept of organisational learning presupposes that there are situations where the organisation actually "knows" far more than its individual members (Fiol & Lyles 1985).

to an organisational level. New ideas and actions flow from the individual and group level to organizational level and what has already been learned flows from an organizational level back to these lower levels. Through periods of restructuring and organisational change it is important to maintain, or increase, the level of productivity and health in the organisation. As today's 'facts' becomes tomorrow's 'misinformation', there is an enormous premium in learning efficiency and an intensified emphasis on the importance of learning how to learn (meta-learning or deuterolearning) (Toffler 1970: 374).

Learning and change in behaviour is considered to be basic for efficiency in the organisation and this can be achieved by various approaches. Nowadays the organisation's success is seen as depending on the organisation's ability to see things in new ways, gain new understandings, and how well they produce new patterns of behaviour (Fiol & Lyles 1985). An organisation's performance can during organisational learning recover and improve its actions through better knowledge and understanding (Argyris & Schön 1996: xix). When considering the health aspect in an organisation, organisational learning is important to promote work processes that are not detrimental to health and well being.

Empirical evidence for the Demand/Control Model

There has been carried out several empirical studies with the Demand/Control Model as the frame of reference since the introduction of the model in 1979. Jan de Jonge and Michiel A. J. Kompier (1997) divide the studies into four different types. One type of study is *cross-sectional* studies done on homogeneous or heterogeneous occupational groups. Parkes, Mendham and Von Rabenau (1994) studied 145 health care workers and revealed that most of the somatic complaints were reported when there were a combination of high psychological demands, little decision latitude and little social support.

There have also been done monitored studies or *experiments* which determine short-term effects of demands and decision latitude on changes on physiological parameters. An example is Ganster and Mayes (1988) who found evidence for a significant interaction between psychological demands and decision latitude with respect to adrenalin level (de Jonge & Kompier 1997). There have also been done participative *intervention* studies or case studies with the Demand/Control Model as a frame of reference, by amongst others Di Martino (1992), Karasek (1992), Kompier, Gründemann, Vink and Smulders (1996). Lastly there are *epidemiological* studies which focus on long-term effects of psychological demands and decision

latitude on worker's health. These kinds of studies are usually based on large-scale examinations on national populations of different occupational groups.

Epidemiological studies offer the most support for the Demand/Control Model and for the strain hypothesis (diagonal A), and evidence confirming the hypothesis has been found in several studies carried out in industrialised countries (Karasek & Theorell 1990). According to Schnall, Landsbergis and Baker (1994) 17 out of 25 studies, or 68%, confirmed the job strain hypothesis or hypothesis 1.

Several of the epidemiological studies focus on cardiovascular diseases (CVD) (de Jonge & Kompier 1997). Johnson and Hall (1988) have shown that the relative risk of CVD is twice as large for workers in a work situation with high psychological demands, little decision latitude and little support than for workers in a situation characterised by low psychological demands, much decision latitude and much support. Especially social support has proven to have an important effect on the occurrence of CVD (de Jonge & Kompier 1997).

Karasek (1979) found support for the hypothesis in accordance to depression in the United States in 1972 and in Sweden in 1968. Similar associations for exhaustion and job satisfaction were found in a large representative sample of workers in Finland (Kauppinen-Toropainen 1981). Braun and Hollander (1988) observed the same tendencies in the Federal Republic of Germany, where a combined measure for exhaustion and depression were detected with both males and females.

For executives and professionals the symptoms of stress related to psychological demands are mild, such as fatigue, and a "feeling of stress" and "rushed tempo". More serious strain symptoms are associated with low decision latitude, which is more common for low-status workers. Examples of such strain symptoms are depression, loss of self-esteem, and physical illness (Karasek & Theorell 1990: 50).

The decision latitude measure is correlated with education and other measures of social class; however the job strain construct is almost orthogonal to most social class measures. Social class is therefore not responsible for the findings earlier mentioned, according to Karasek and Theorell. Karasek found in 1979 that controls for demographic and social class factors did not reduce such an association in Sweden (Karasek 1979). This finding was confirmed in a

study of Swedish white-collar workers in 1987 (Karasek, Gardell & Lindell 1987). Similar observations have been found within both white-collar and blue-collar groups in the United States, Sweden and other countries. But according to Karasek and Theorell there is overall uncertainty whether job strain associations are stronger among white-collar or blue-collar workers (Karasek & Theorell 1990).

Karasek (1979) presents one explanation why associations might be weaker for high-level white-collar workers. For the highest-status managers and professionals both decision-making and skill acquisition can become a significant demand in itself. This may be a problem with high-status managers and professionals as physicians and administrators. In these high status occupational groups there has been a substantial amount of research on correlation between their professions and burnout. There is a general agreement that burnout has much in common with exhaustion and depression, but the effects of decision latitude are yet to be properly addressed. The focus has been on the social-emotional demands of client-contact, which again leads to depersonalisation, that service workers face. The level of control and decision latitude was more recently addressed as being important in research on these professional groups (Karasek & Theorell 1990). *Intervention studies* have been aimed on improving health by modifying stressful work condition and enhancing active learning behaviour. Such studies, which address the second assumption in the Demand/Control Model, can be case studies in naturalistic settings where control groups not always are present (de Jonge & Kompier 1997).

Critique of the Demand/Control Model

The Demand/Control Model has been exposed to different criticisms and comments, some of them are presented by Jan De Jonge and Michiel A. J. Kompier (1997) in the *International Journal of Stress Management*.

One criticism is a concern for the conceptualisation and operationalisation of job characteristics. Different sources have been critical of the scales used, and are of the opinion that they don't reflect the psychological demands or decision latitude as several job characteristics are involved in the constructs. For example can too much decision latitude be a source of stress as well as it can be a benefit for the employee (de Jonge & Kompier 1997).

Another point that has been criticised is the lack of exploration of interactive effects in the model. Karasek evades this issue by stating that the nature of interaction has a practical meaning, and that well-being and health can be predicted by different combinations of job characteristics. The interactive effect in the model is explained through how decision latitude and social support function as moderator variables for the negative effect of the psychological demands. And then also how little decision latitude and little support, together with high psychological demands, have negative effect on health. These presupposed interactive effects of psychological demands, decision latitude and social support are not found very often, and when they are found they have proven to be statistically weak (de Jonge & Kompier 1997).

The Demand/Control Model is said to be advantageous because of the interactivity between three work characteristics; demand, control and support. On the other hand this is also said to be the model's weakness. There are other characteristics that are important predictors of difference in health which are not considered, for example job insecurity, physical risk factors or physical exertion. Another weakness found in the model is the unclearness in how stress and motivation operate together. Since reduced stress increases learning and motivation, it is important to clarify how these two psychosocial mechanisms concurrently function with each other. Another dilemma with the model is its simplicity. Although it is practical with simpler models, organisations need more detailed knowledge of how to make judgements for stress prevention and job redesign. But the Demand/Control Model can not provide such information, according to de Jonge and Kompier (1997), because it is said to be too simple.

Further the model does not consider the postulated curvilinear u-shaped relationship between job characteristics and employee health. This curvilinear pattern is explained by how too little or too much decision latitude can lead to strain. When the employee has little control, the stress and strains will be harder to handle, and it may influence the worker's health. Too much control can be unfavourable as well, because it can involve complex decision-making and much responsibility (de Jonge & Kompier 1997).

The model is also criticised to disregard any individual differences between people. The model does not take into account personality characteristics which are considered very important for the effect of the different job characteristics. Examples of suchlike variables can be coping behaviour, locus of control and type A/B behaviour. Various authors claim

that the effect of demands and decision latitude are influenced by a variety of different factors. Examples are job characteristics, socioeconomic status, health-related behaviour, personality characteristics and the duration of the exposure (de Jonge & Kompier 1997).

Another point that has been criticised is the methodology which the model is based on. The model has been examined quantitatively through different questionnaires, which have been completed by the respondents themselves. Even though questionnaires are useful for recording people's opinions about their jobs and health, the method also has problems. The method has been criticised for struggling with problems like social desirability, information bias, cognitive processes and contamination by third factors (de Jonge & Kompier 1997).

Another criticism is directed at the sampling of data previous to the development of the model. The research on the model is based on large-scale, representative research populations. A representative random survey and a high response rate are generally positive research characteristics, but there are negative effects as well. One example is the lack of specific knowledge about individual jobs within the defined occupational fields which makes it impossible to study the particular personality characteristics of those workers in a valid way. Many of the respondents have an average exposure, which results in little statistical power. The wide variety in socioeconomic status and health related behaviours in such a large group are also problematic.

According to de Jonge and Kompier (1997) there have been various comments on the model, but even though, they say it is important to remember that the criticism and comments concerning the Demand/Control Model also apply to other theoretical models in work and health. De Jonge and Kompier (1997) conclude; that even if the model has been criticised, the core structure of the model still holds.

IV DATA AND METHOD

Design and sample size

This longitudinal study was part of the project: *Restructuring the electric energy industry: work design, productivity and health* funded by the Norwegian Research Council as part of the intervention program *Health in Working Life*. The surveys were arranged by Rogaland Research in cooperation with Department of Biological and Medical Psychology (University of Bergen) and Norwegian Electricity Industry Association (EBL).¹³

The Norwegian Electric Industry Association provided a list of all Norwegian electric energy companies which was used to make a random selection of companies. An open invitation with detailed research description was sent to approximately 120 randomly selected energy companies. Of all the companies inquired, thirteen energy companies with a total of 180 departments and 3,335 employees volunteered to participate. In each company the project had a contact-person to help with the practical administration of the project.

The *Health in Working Life* project was approved by the Regional Ethical Committee and the Norwegian Data Inspectorate. The respondents were fully informed as to the nature of the project, informed of their rights, and informed that they had the right to withdraw from the project at any time without prejudice. The administration of the questionnaire was done after informal introductions to the leaders and the employees of the different organisational units. Before filling out the questionnaire, all subjects signed a Declaration of Consent Form where this information was given.

The project started in 1999, when it was presented to the companies in October and November. The initial phase consisted of individual interviews and focus group interviews with top managers, human resource managers, supervisors, health and safety representatives and key informants on the shop floor. In addition, there were several group interviews at the shop floor. Archived data were retrieved from annual reports and available written documentation on HRM-systems (brochures, handbooks and memos), policy documents, and project reports were collected and subjected to content analysis.

¹³ Former Energiverkenes landsforening (EVL) and Energiforsyningens Fellesorganisasjon (EnFo).

Three measurements by a postal questionnaire were used in this study, the first one in 1999, the second in 2000 and the last in 2002. The questionnaire consisted of 24 pages and contained measurement instruments on background data, organisational changes, management, work climate, stress and health.

The responses from the questionnaires were encoded and added as SPSS-files. At the second and third measurement (respectively in 2000 and 2002), work units that were closed, merged or in other ways changed were kept as the original ones in the analysis of the survey data. This was due to the sample that consists of individual employees with department as one of the variables describing them. Standard statistical tests from the SPSS package were used for all analyses reported in this thesis.

Response rate and demographics of the study

The first of three surveys in the study was carried out in November 1999 with a response rate of 73% (varying from 55% to 100% in different companies). The other surveys were conducted in 2000 and 2002. At the second measurement in 2000 the response rate was 72%. At the last measurement in 2002 the response rate was 66%. There were a total of 2442 participants in the first survey, 1765 in the second and 1165 in the third one. The demographic characteristics of the respondents are listed in Table 4.1.

***Table 4.1** Demographic characteristics of the participants in the surveys*

	1999			2000			2002		
	%	SD	N	%	SD	N	%	SD	N
Percent men	80.9	-	2435	81.4	-	1765	82.2	-	1165
Mean age	43.5	10.3	2394	44.4	9.5	1749	46.6	9.0	1159
Mean number of years at school	12.8	2.7	2380	-	-	-	-	-	-
Percent married/partners	64.2	-	2426	75.9	-	1693	77.4	-	1114
Mean hours of work per week	36.4	4.6	2386	36.7	4.3	1747	36.7	4.1	1142
Percent leaders	35.3	.841	2416	36.8	.846	1768	39.7	.850	1155

At measurement 1 in 1999 80.9 % of the respondents were male, and the average age was 43.5 years (SD = 10.30). Further 64.2 % of the participants were married or had partners. The average number of years the participants had spent studying in school were 12.8 (SD = 2.79).¹⁴ The mean hours of work pr week were in 1999 36.4 (SD = 4.69). 35.3 % of the 2416 respondents reported that they were leaders with or without direct responsibility for personnel. In 2000 (measurement 2) 81.4 % of the respondents were male, and the average age was 44.4 years (SD = 9.5). 75.9 % of the participants were married or had partners. Further the mean hours of work pr week were 36.7 (SD = 4.3), and 36.8 % of the 1768 respondents reported that they were leaders with or without direct responsibility for personnel. At the last measurement in 2002 82.2 % of the respondents were male, and the average age was 46.6 years (SD = 9.0). 77.4 % of the participants were married or had partners. The mean hours of work pr week were 36.7 (SD = 4.1), and 39.7 % of the 1155 respondents reported that they were leaders with or without direct responsibility for personnel.

According to the demographic characteristics in Table 4.1 the sample stayed relatively stable throughout the project period.

Measurement instruments

The demand, control and support dimensions were measured by a questionnaire developed by Theorell, Michélsen and Nordemar (1991), a short version of the *Job Content Questionnaire* (Karasek 1985). The instrument consists of 17 items, where five items cover the *demands* dimension (“work fast”, “work hard”, “excessive work”, “enough time” and “conflicting demands”). A test of reliability of the five items in the demands measurement gave a Cronbach’s alpha of .71. The control-scale consisted of two dimensions; skills discretion and decision authority. *Skills discretion* was measured by four items (“keep learning new things”, “job requires skill”, “job requires creativity”, “repetitive work” (scored negatively)). Here the Cronbach’s alpha was only .53, but were kept unchanged due to the international validation of the scale. *Decision authority* was measured by two items (“have freedom to make decisions”, “can choose how to perform work”), with Cronbach’s alpha of .70. Social support was

¹⁴ “Years of school” are only measured in 1999, a consequent action to reduce the size of the questionnaire at measurement 2 and 3. Even though one could assume that very few respondents have increased their educational level between 1999 and 2002, this represents a limitation which is further elaborated in the concluding chapter (Chapter VIII).

measured by six items (i.e. “we support each other” and “I get along with my superiors”). Cronbach’s alpha was .83.

Team organisation was measured by a one-item question from *QPS Nordic* (Nord 1997).

Perceived job stress was measured by *Cooper’s Job Stress Questionnaire* (Cooper 1981). This instrument consists of 22 questions and each answer is rated on a six-point scale ranging from zero to five. In this study two items were added to the original instrument: Stress connected to the implementation of new technology, and stress due to lack of learning and developing opportunities. A high score indicates high experience of stress in the work situation. A summated scale of all the 24 items on *perceived job stress* gave a Cronbach’s alpha of .92.

Job satisfaction was measured by Quinn and Shepard (1974), and four items were used. Job satisfaction was presumed to be a global construct where the various job dimensions, both events and agents are aggregated into an overall orientation termed *job satisfaction*. Cronbach’s alpha was .80 (Mikkelsen, Landsbergis, Bakke, Gundersen & Jøsendal 2002).

Subjective health complaints were measured by *Subjective Health Inventory* (SHC). The instrument consists of 29 items and describes subjective and psychological health complaints experienced during the previous 30 days (Ursin, Endresen & Ursin 1988, Eriksen, Ihlebæk & Ursin 1999). The dimensions in the instrument are: pseudoneurological problems (sadness/depression, anxiety, sleep problems, tiredness, dizziness) (eight items), muscle pain (six items), cold/influenza (two items), allergy (three items) and gastrointestinal problems (seven items). The complaints were scored on a scale from 0 (no complaints) to 3 (severe complaints). Cronbachs alpha was .79 (Mikkelsen et al. 2002).

Data analysis

Conclusions in the paper are drawn on descriptive analysis and multiple regression analysis of the scales and variables of current interest. The distributions of scores were in advance checked for normality through histograms displaying a normal curve.¹⁵ The scales used in this study were all tested for internal consistency with Cronbach’s Alpha preliminary to the

¹⁵ Normality is the most commonly occurring score which is used to identify the unusual and statistical rare. The normal distribution is defined through mean and standard deviation (Skog 1998).

analysis.¹⁶ Significance tests were executed in all statistical analysis in this study, to decide if the relationship between two or more variables in the sample could be generalised to the population. To test the significance of the changes observed in my analysis, Paired-Samples T Test were executed.¹⁷ The variance from measurement 1 to measurement 3 could also have been analysed through an analysis of variance or f-test.¹⁸ Those variables which couldn't predict any changes or interesting findings were excluded from this presentation.¹⁹

Advantages and disadvantages of longitudinal designs

This study wishes to find out whether organisational changes, due to deregulation and organisational restructuring, affect job content and worker health. By comparing the data from three different points in time I hope to be able to see if job demands, control and social support influence the employees' stress level, job satisfaction and health. This study will therefore have a longitudinal design, and will use the data from all the three measurements (1999, 2000 and 2002).

There are two main reasons that longitudinal studies have become popular: it gives the researcher an opportunity to gather information on a micro level, and in this way be able to measure change over a period of time. Secondly, since you don't need another sample, this method is often cheaper than cross-sectional studies (Rose & Sullivan 1996). There are several other advantages with the use of longitudinal design as well. It is a proper tool used to study individuals' behaviour over time and their potential change and dynamic in behaviour. Longitudinal data also makes it possible to examine transitions between states. The use of longitudinal data allows a control for certain unobserved determinants of behaviour, especially the unobserved factors which vary across individuals but remain the same across time for any given individual (Rose & Sullivan 1996). Another great advantage with longitudinal studies is the opportunity to study the succession of cause and effect. You also get a chance to a closer study of the temporal structure (Skog 1998).

¹⁶ The alpha value is a result partly of the strength of the correlation between the indicators, and partly by the numbers of indicators. The stronger correlation between indicators, the better the reliability. The nearer the results is to 1 (or preferably over 0.7), the more internally reliable is the scale (Ringdal 2001).

¹⁷ Significance tests offer various levels of significance or confidence. They state that a particular statistical result would only occur by chance less than one in a hundred times (0.1 level), or less than one in twenty times (0.5 level). Depending on the degree of certainty required by the researcher, results at any of these levels might be accepted as significant. The Paired-Samples T Test procedure compares the means of two variables for a single group (Rose & Sullivan 1996).

¹⁸ F-test is an extension of the t-test, and is a significance test for determining whether two or more means are significantly different. F is the ratio of systematic variance to error variance (Cozby 1997).

¹⁹ Preliminary tests showed that creating change variables of the scales (demands, control and support) had no particular effect, and therefore this was not done in the test in this thesis.

There are also several disadvantages with longitudinal studies. One disadvantage is the problem with non-response or panel attrition in the process. It may be a problem to track down participants when the second or third survey takes place, and even if you are able to track them down, they may be reluctant to participate. These kinds of denials must be granted, because it does not necessarily represent a genuine problem. It is only a problem when the non-response is biased and overrepresented in some of the groups of the sample (Skog 1998). Another problem with longitudinal surveys is the respondents' recollection. They might remember what they answered in the previous survey, and they answer the same in the present in order to score "right". Lastly, a problem with longitudinal design is the fact that the process is expensive. Surveys can cost a lot in time and money, in both the gathering of data and subsequent the data analysis. It can be an extensive process to track down, often several thousand, earlier respondents. The survey has to be forwarded and then later collected back. Many respondents also need to be reminded of the survey, and to return the answers. A last disadvantage with longitudinal designs is the size of the collected data material. When the data are collected for the second, or maybe third, time the data amount can be enormous and more difficult to analyse than in cross-sectional analysis (Ringdal 2001).

Methodological comments

There are several concerns one has to consider when performing a statistical study. The sampling process, the execution of the analysis and interpretation of the results may involve aspects which could represent limitations for the study.

As mentioned in Chapter I, one can question if the data used in this thesis actually *can* describe the consequences of the New Norwegian Energy Act of 1991. Since the data was collected 8 to 12 years after the deregulation resolution in 1991 the surveys would have difficulties providing useful and valid information. But as mentioned earlier in the thesis (see chapter II) there are a number of reasons why the effects of the resolution were, and still are, noticeable a decade after the act became efficient. One example is NVE's and the government's introduction of provisions to regulate both income and costs. This delayed the activity from both companies and customers the following years after the deregulation. Also purchases, mergers, workforce reductions and other organisational restructuring actions were done over a long period of time and still characterise the Norwegian electric energy branch a decade after the new law became effective in 1991. So even if the data in this thesis not exactly measures the consequences of the resolution, it

measures *consequences* of a *period* where the deregulation resolution had an *effect* on the Norwegian electric energy branch.

One could argue that there is a problem with the sample's representativeness. The companies, who were chosen to participate in this study, were randomly selected from a list of electrical companies provided by the Norwegian Electricity Industry Association (EBL). The list contained a complete record of Norwegian electrical energy companies with membership in EBL. Regardless of this; those who were employed in one of the companies in the project period had not an equal chance of being picked. In this study the individuals aren't individually selected, since it is the companies that are selected. The respondents are, strictly speaking, not independent respondents. So it was the *companies* and not the *individuals* who had an equal chance of being selected for this study, since the list of companies invited to participate was randomly picked. This represents a problem since one presumption for proper regression analysis is independently drawn individuals. When all the respondents are selected from one single company, or sample unit, they are all exposed to the same work environment which constitutes a problem to the sample's representativeness. There are ways to correct for these statistical concerns, but they are too demanding and time-consuming for this project (Skog 1998).

Another problem could be the overrepresentation of men in the branch. According to Table 4.1 over 80 % of the employees in the Norwegian electric energy branch are men. One explanation for the predominance of males is the branch's dependency on engineers. The sector is dependent on, and dominated by, engineers who are skilled in production and distribution of electrical power. Since the science of engineering traditionally has been male-dominated, this would manifest itself in the gender distribution in this study. The overrepresentation of men could be a problem if there are differences in how men and women perceives for instance work demands, stress, social support or control. These are aspects which represent a limitation, and which must be considered when analysing the data.

Another limitation with this study is the decreasing response rate from measurement 1 to measurement 3. The first of three surveys had a response rate of 73%, and the other surveys had a response rate on respectively 72% (2000) and 66% (2002). There were a total of 2442 participants in the first survey, 1765 in the second and 1165 in the third one. Non-response or panel attrition is usually a problem with all longitudinal studies, as it may be a problem to

track down participants when the second or third survey takes place, and even if you are able to track them down, they may be reluctant to participate. One problem with non-response is the probability of finding significant values. Since a larger sample size increases the probability of finding significant values, sample attrition could represent a problem to my statistical analysis. Non-response is also a problem since the *net sample*, or the sample of respondents or units who *did* respond, could be biased. Non-response represents only a problem when the non-response is biased and overrepresented in some of the groups of the sample. If the attrition amongst the companies is not random, this could represent a problem. It is reasonable to assume that companies which succumbed to market exposure or cost saving in the project period did not participate at all three measurements. If a company was bought and incorporated by another company this would also influence the response rate. Non-response for both individuals and companies would represent an obstacle for a representative result, and has to be considered when analysing the data.

Another, and different problem would be if it was the individuals (and not the companies) who didn't respond at measurement 2 and 3. There might be different reasons to why the employees didn't participate at all three measurements. The employees in the electrical energy companies might have changed their relation to their company, and therefore failed to respond at measurement 2 or 3. The workers might have quit their job, or lost their job in the company as a result of downsizing as companies disposed numbers of workers to save costs through different downsizing actions. Simultaneously new groups of workers were hired to fulfil new work tasks in the companies. This could influence on the response-rate on the different measurements, and show that it is not only the *size* of the sample, but also the *composition* of the sample which might influence the results. One problem with the composition of the sample would occur if the companies got rid of the workers with the "weakest" health. If the downsizing actions struck workers most frequently reporting ill-health, the total health state of the company would be improved. This would represent a bias in the study's sample.

As seen above, there are several limitations to the design and sample used in this thesis. It is important to bear those in mind when analysing the data and interpreting the results of the statistical tests.

V JOB CONTENT

According to Thompson and McHugh (2002) new work demands arise as a natural result of a more global economic world. Surveys and qualitative case studies in the UK provide information of increased time pressure and work pace (Collinson & Collinson 1997). A form of time pressure reported is the time pressure which appears around the activities of new demands, team organisation and cost reductions. Similar tendencies might be seen in the Norwegian electric energy branch as deregulation and organisational restructuring may have changed, or at least influenced, the employees' job content.

When the electric energy branch went from a monopolistic situation to be exposed to competition, some aspects of the business changed. The branch experiences increased competition in both internal and external markets; a competition that results in higher pressure and work demands both quantitatively and qualitatively. The focus on effectiveness and economic rationality have forced the branch to restructure, a process which led to, amongst other factors, termination of employment contracts, employment of marketing and economic personnel and new requirements for the workers. This means staff cuts, increased work load and time pressure (Thompson & McHugh 2002).

Where the companies' income before was reliable and constant, the companies' income today is dependent not only of the market situation, but of the competitive power each companies holds. The market competition leads to a stronger customer focus, and calls for an intensification of business strategy and a restructured organisation to uphold the company's share of the market. Increased demands from customers and custom orientation may be an expected result of deregulation. The companies in the electric energy branch are struggling for the same customers, and sales activities have become important. The need for competitiveness also introduced the demand for employees with social competence and service mindedness. The competitive market situation also creates a need for professional groups in the energy sector like marketing people, economists and experts on customer relations. This means demands for new ways of thinking for the company as a whole and for each employee individually (Mikkelsen, Nybø & Grønhaug 2002).

Other new demands might also occur as a consequence of deregulation and organisational restructuring. New technology, new forms of communication, ability for decision making and problem solving might be new demands arising in the deregulated energy branch.

The European Foundation for the Improvement of Living and Working Conditions reports a similar tendency in increased strain and demands level. The Foundation shows that the proportion of high-strain jobs in Europe increased from about 25% in 1991 to about 30% in 1996 (Landsbergis, Schnall & Cahill 1999: 108). When the number of high-strain jobs increase, control and decision latitude for the workers is getting more and more important. An important aspect of the “new” organisational work design is therefore to which extent the employee has control over planning and organisation of his or hers own work tasks. According to Robert Karasek and Töres Theorell, job control is important because employees report no harm on their well-being as long as there is a positive change in work characteristics such as job control, responsibility and learning opportunities (Karasek & Theorell 1990).

The deregulation resulted in new management and HRM-systems, for example new computer software systems dealing with sales reporting, economy and task delegation and coordination. New systems now make it possible to pass orders to the employees electronically by allowing them to plan and organise their own work to a larger extent than before. Earlier instructions were most often given to the employees from the supervisor in face-to-face situations. The new planning systems may have increased the employees’ control over their jobs. When the top managers from the thirteen electrical energy companies, which participated in the study, were interviewed, they reported that several changes had occurred as a result of the new energy act. They reported that different actions were made to help the workers gain job control in the new situation after the restructuring, as changes in learning, flexibility, influence and stimulation (Mikkelsen, Nybø & Grønhaug 2002).

Also Landsbergis, Schnall and Cahill (1999) show that in Europe, from the middle of the 1970s to the middle of the 1990s, there has been an increase in the proportion of workers reporting a measure of autonomy over their pace of work (from 64% in 1991 to 72% in 1996). In the United States, “freedom to decide what to do on my job” increased from 56% in 1977 to 74% in 1997, and “my job lets me use my skills and abilities” increased from 77% in 1977 to 92% in 1997 (Landsbergis et al.1999: 108). The same tendencies were reported by

the *Norwegian Study of Living Conditions* (Norsk levekårsundersøkelse). According to this study the number of employees which has low decision latitude has been reduced from 25 percent in 1980 to 17 percent in 1996. This decrease was somewhat less for men (from 22 to 15 percent) than for women (from 29 to 19). The number of men who had high decision latitude increased gradually from 44 percent in 1980 to 57 percent in 1996. For women the change increased even more towards the end of the period, from 38 percent in 1991 to 40 percent in 1996. The *Norwegian Work Environmental Studies* showed the same tendencies (Sosialt utsyn 2000).

Further one could also assume a changed situation for social support in the reorganisation electric energy branch, when team organisation, specialised production and random switching of positions may ruin old and prevent new supporting relationships. The new competition in the market may also set worker against worker to a larger degree than earlier. The demands, workload, pressure, strain and stress presumably increase after the deregulation, and so does the need for social support, both at work and at home (Karasek & Theorell 1990: 312). Karasek and Theorell give evidence that low levels of social support may worsen the relationship between already high demands and low control. For instance 11 % of the risk for cardiovascular illness can be eliminated through social support at work, according to Karasek and Theorell. Work situations can be much more demanding, and the pressure and stress at work can be higher, if the degree of social support is high (Karasek & Theorell 1990).

Considering the changes in psychological job demands, job control and social support observed in work places and organisations during the recent decades, we can assume similar changes in Norwegian organisations as well. I therefore assumed that there has been a change in job content as a result of deregulation and organisational restructuring in the Norwegian electric energy branch.

Changes in psychological job demands, job control and social support

According to my first assumption illustrated in Figure 1 there has been a change in job content as a result of deregulation and organisational restructuring in the Norwegian electric energy branch.

Table 5.1 *Changes in psychological job demands, job control and social support from 1999 to 2002*

		1999	2002
Demands	Mean	13.08	13.03
	SD	2.41	2.36
	N	2407	1162
Control	Mean	18.49	18.55*
	SD	2.50	2.40
	N	2415	1155
Support	Mean	19.12	19.13*
	SD	2.732	2.567
	N	2418	1159

* $p < .05$

Table 5.1 shows that there have been small and insignificant changes in *psychological job demands* from 1999 to 2002. The mean-values show stable scores with 13.08 in 1999 and 13.03 in 2002. The standard deviation is decreasing in the same period from 2.41 to 2.36. The results from the paired-samples t-tests show that none of the changes in *psychological job demands* were significant on a .05-level. Further Table 5.1 shows that there are small, but significant, changes in *job control* from 1999 to 2002. The mean-values show a slightly increasing score from 18.49 in 1999 to 18.55 in 2002. The standard deviation is decreasing for the same period from 2.50 to 2.40. The results of t-tests show that the changes in *job control* from 1999 to 2002 are significant on a .05-level ($p = .037$). Table 5.1 shows little, but significant, changes in *social support* amongst workers in the energy companies questioned. At the first measurement in 1999 the mean for *social support* was 19.12. At measurement 3 in 2002 the mean reported is 19.13. Table 5.1 further shows the results of the paired-samples t-tests of the changes in *social support*. The change in the scale from measurement 1 (1999) to measurement 3 (2002) is significant on a .05-level ($p = .005$).

Table 5.1 shows no, or small, significant changes in *psychological job demands*, *job control* and *social support* from measurement 1 to 3. There might, however, be differences in experienced *psychological job demands*, *job control* and *support* within the work force in the electric energy

branch. It is therefore interesting to compare leaders and non-leaders and see if *their* experienced *psychological job demands*, *job control* and *social support* have changed from 1999 to 2002.

Leaders and non-leaders

An increased pressure at work may probably be experienced by both employees working outdoors and by white-collar workers, leaders and non-leaders. But in changing environments, as those seen in the electric energy sector, it is reason to believe that supervisors' attitudes and behaviour are still more important than in more stable surroundings.

Changes in an organisation may mean heavy demands for leaders. Leaders are often in special positions in organisations, as to freedom to regulate their own work, degree of responsibility, decision latitude and power. Consequently it is possible that the leaders experience demands and control differently than non-leaders. But according to analyses in the USA, executives and professionals receive higher incomes and enjoy the highest psychological rewards from work and they also have the highest job satisfaction. Leaders maintain average health despite active work and leisure time, and do not have the highest levels of psychological strain in the US work force. As Karasek and Theorell put it: "it is not the *bosses*, but the *bossed* that experience the most stress in our society in general" (Karasek & Theorell 1990: 44). It is therefore interesting to compare leaders and non-leaders and see if their experienced level of psychological job demands, job control and social support has changed from 1999 to 2002.

The "leader-group" consists of employees who responded that they were "leaders" (with or without direct responsibility for personnel) at all three measurements. The "non-leader"-group consists of employees who responded that they were not leaders on any measurement. Paired-samples t-tests were run to check if the changes reported from 1999 (measurement 1) to 2002 (measurement 3) were significant.

Table 5.2 *Changes in psychological job demands, job control and social support for leaders and non-leaders from 1999 to 2002*

		Leaders		Non-leaders	
		1999	2002	1999	2002
Demands	Mean	13.88	13.69*	12.64	12.63
	SD	2.30	2.28	2.360	2.310
	N	845	459	1544	690
Control	Mean	19.64	19.47	17.86	17.97
	SD	2.21	2.20	2.48	2.34
	N	848	457	1549	685
Support	Mean	19.21	19.47	19.07	18.89
	SD	2.53	2.48	2.83	2.59
	N	851	457	1549	689

*p< .05

Table 5.2 shows the relationship between *leadership* and *psychological job demands, job control* and *social support*. Those who reported that they were leaders with or without direct responsibility for personnel had more *demands* at measurement 1 in 1999 than at measurement 3 in 2002, which is a small decrease in *demands*. The same tendency is seen for the non-leaders who report a small decrease in *demands* from 1999 to 2002. *Job control* for leaders is gradually getting weaker from 1999 to 2002, as the mean-score drops from 19.64 to 19.47. *Job control* for non-leaders is, on the other hand, getting stronger in the same period. *Social support* for leaders are getting stronger from 1999 to 2002, and the opposite tendency is seen for non-leaders in the same period, who report a decrease in support. Table 5.2 shows that it is only the changes in *demands* from 1999 to 2002 which are significant ($p = .005$). The other changes in *demands, control* and *support* for leaders and non-leaders are not significant.

Changes in demands and control on item-level

When I measured psychological job demands and job control by the overall scales I found small and insignificant changes over time. The same tendency was found when I tested leaders and non-leaders for changes in demands and control.

Using a scale to detect changes may level the effect of changes in single items. If one variable increases and another variable decreases, the change will not be discovered. By observing the variables on an item-level we can determine if the pattern for change in demands and control is different than for those reported for the scale. Exploring the variables on item-level can

also be an important exercise when companies want to develop interventions to improve an organisation's situation. Paired-samples t-tests were run to check if the changes reported from 1999 (measurement 1) to 2002 (measurement 3) were significant.

Table 5.3 *Changes in psychological demands from measurement 1 to measurement 3*

Percentage of workers reporting that their work <i>often or sometimes</i> demands.....	1999	2002
...a fast pace	89.6	88.2*
...learning of new skills	93.1	93.9*
...inventiveness and creativity	91.4	91.5*
...competence	98.9	99.0*
...fast decision making	85.9	87.2*

*p< .05

Table 5.3 shows that there is a small decline in respondents reporting that their work “often or sometimes” demands *fast pace* from 1999 to 2002 from 89.6 % to 88.2 %. The table also shows that the number of respondents reporting that their work “often or sometimes” demands *learning of new skills* increased slightly from 1999 to 2002 (from 93.1 % in 1999 to 93.9 % in 2002). The table further shows a small but significant increase in demands for *inventiveness and creativeness* from 1999 to 2002. The percentage of workers reporting that their work “often/sometimes” demands *inventiveness and creativity* increases from 91.4 % in 1999 to 91.5 % in 2002. In 1999 98.9 % report that their work demands *competence*, a number which increases to 99.0 % in 2002. In 2002 87.2 % of the respondents report that their work “often or sometimes” demands *fast decisions*. That is an increase of 1.3 % from 1999. All the changes reported in Table 5.3 were tested with paired-samples t-test and found significant on a .05-level.

Table 5.4 Changes in job control from *measurement 1 to measurement 3*

Percentage of workers reporting that their work <i>often or sometimes</i> allows them to.....	1999	2002
...learn new skills	84.1	86.1*
...choose their working hours	63.8	76.6*
...choose their co-workers	40.4	45.9*

* $p < .05$

Table 5.4 shows that 84.1 % report in 1999 that they “often or sometimes” have the *opportunity to learn new skills at work*. That figure increases significantly to 86.1 % in 2002. The table further reports the number of workers who claim that their *working hours are flexible*. In 1999 the percentage in the “often/sometimes”-group are 63.8 %. In 2002 the percentage in the same group has increased to 76.6 %. This is a significant difference of 12.8 %. Table 5.4 also presents the number of respondents who report that they can *choose their co-workers*. 40.4 % in 1999 and 45.9 % in 2002 report that they “often/sometimes” can choose who they want to work with. All the changes reported in Table 5.4 were tested with paired-samples t-test and found significant on a .05-level.

Discussion

The analyses show small overall changes in *psychological job demands*, *job control* and *social support*. However, both the *psychological job demands* scale and the *job control* scale show significant changes on item-level from 1999 to 2002.

The results of the analysis in Table 5.1 show no significant changes in demands from 1999 to 2002. One explanation to this result may be that the psychological job demands in the electric energy branch boosted right after the deregulation in 1991. During the period following the deregulation resolution several new changes appeared in the branch; changes which increased and introduced new psychological job demands. When the first of the three studies was conducted it had been 8 years since the deregulation. It is possible then that there had been many changes in the level of demands, but that the demands growth-curve was flattening throughout the 1990s. When the three studies were carried through, the demands-level was constant and stabilised. Another explanation for the small changes reported in the Norwegian

electric energy branch might be a result of the actual implementation process of new procedures and routines. If the introduction of new procedures and other changes was done properly, this might have influenced the workers comprehension of the new demands, so that they reported no new demands or negative effects.

One example of this is time pressure. The surveys showed that the workers did not experience the anticipated increase in time pressure and fast work pace as expected as a result of the deregulation. As Table 5.3 reports there is an improvement in time pressure from 1999 to 2002. Time-pressure is also an aspect when it comes to decision making. An increasing share of the Norwegian energy workers reported that they experienced some kind of change or intensification in decision making from 1999 to 2002 (see Table 5.3). The deregulation changed the whole organisational structure when becoming competitive, and this might be one of the reasons for the change in decision making pace. To keep up with competitors, decisions concerning sale and price become crucial in the electric energy branch. Decisions have to be made fast, which puts great pressure on the ones making the decisions.

Table 5.3 further reports an increase in those who report that their work demands competence. This could be related to the fact that a new group of workers are included in the branch; that is marketing personnel and economists. The new workers have another education and experiences than the traditional work force of engineers. But even if the diversity in tasks and occupations is changed, it is important to remember that all the workers hold different competence. This opinion is also in accordance to what the workers respond in this study. Another explanation for the increase in reported competence could be a process of increased awareness (as a result of deregulation and restructuring actions) for each and everyone's skills and capabilities. When the workers feel that their skills and competence is important and indispensable for the organisation, they will feel responsible and in control. Through organisational restructuring the importance and presence of competence is often emphasized, and hence, the workers will become aware of their own skills and knowledge.

According to Table 5.3 the opportunities for Norwegian electric energy workers to learn new knowledge and skills have increased from 1999 to 2002. One explanation for this might be a higher degree of problems and dilemmas in the branch after the deregulation. When trying to deal with these problems, learning occurs. Argyris and Schön (1996) claim that learning occurs when the workers experience problems they try to deal with, so increased learning

might therefore imply a higher degree of problems in the organisation. Even if the individual needs an amount of “stress” to learn it is important that the organisation arrange and adjust for an unproblematic restructuring and for a healthy and happy work environment for the workers.

An increase in decision making can indicate that the level of learning and decision latitude in the Norwegian energy companies in question, has risen after a period of restructuring due to deregulation. A more composite work day with team work, new tasks and a flatter structure in the branch, would also implicate more difficult decision making. A situation with lots of demands is not necessarily damaging to the individual, even if it sounds contradictory. The concept “executive stress” is well-known, and implies that leaders do not necessarily report more health and stress complaints even if they have a high level of demands at work. Studies show that it is not the decision making in it self, but the *constraint* on decision making which constitute the biggest problem, that is; the *control* and *decision latitude* over ones own work which mediates the psychological job demands (Karasek & Theorell 1990).

The new competitive situation in the energy branch might have increased the intensity level in different ways. But if the organisations are aware that new demands might arise as a result of restructuring, they can also take precautions by giving the workers more decision latitude or control in their work day. As a result of extensive restructuring activity, learning and flexibility initiatives in the Norwegian electric energy branch it was expected to find increased job control amongst the workers. This study shows, however, only a small (but significant) increase in the job control scale from 1999 to 2002 (see Table 5.1).

One explanation for the increased control could be explained by a stronger awareness of the importance of decision latitude and learning in a branch influenced by restructuring. When an organisation is restructured, and the strain and stress level are increasing, control for the workers are getting more and more important. If the organisation through leaders and managers take such consideration, the comprehension of control might increase amongst the workers. Another explanation is that the trend in the working life is moving against more worker control. Flexible solutions, team work and self-determination has during recent years become more and more common in companies; trends which will increase the workers perception of control.

In the Norwegian electric energy branch there is an increase in workers reporting that their work allows them to learn new skills, which again will increase the competence level. With the restructuring period following the deregulation the workers had to adapt to the new computer-based ordering system. The system made it easier for the employees to plan their own tasks for the day, which gave the workers a feeling of control. When the workers are given the opportunity to learn, this will increase their level of control. And with a high level of job control the motivation for learning will increase, and so will the level of control. Learning and control are in other words strongly related, and the possibility to learn is important for the feeling of job control.

A workday with increased control, decision latitude and influence, will usually involve flexibility in working hours as well. The increase in flexibility (presented in the Table 5.4) might suggest that the restructuring in the electric energy branch in the 1990s had a positive effect on the working hour flexibility. According to the table the percentage of workers reporting that their working hours were flexible rose with 12.8 % from 1999 to 2002. Being able to decide when to come to work and when to leave is providing the worker with a large degree of control over their own work day. But it has been claimed that the flexible working hours is not necessarily a benefit to the employees. Even if the workers have the possibility to leave early one day and catch up the following day, studies have shown that the workers work longer hours than they are supposed to. According to Catherine Casey, one explanation is that the workers feel a need to compensate for the goodwill shown by the management when providing flexitime (Casey 1995).

Another aspect of control over ones own workday is also seen in Table 5.4 The table shows an increase in number of workers reporting that they can decide with whom they want to work. When the electrical energy branch was deregulated flexibility was a presumption. To be competitive, team work was found to be effective. If team work is going to be effective there has to be collaboration which function and are efficient. The increased possibility to choose co-workers for different tasks is arranging for team work to be functional. Even if it could be considered to be the company's way of securing prosperity, the freedom to choose co-workers is another indication of increased control at work.

According to Karasek and Theorell (1990) a low degree of job control and decision latitude may result in illnesses such as myocardial infarction. So it is not only important with job

control for the individual, but it is important for the organisation as a buffer against the large expenses with sick leave. Another mediator for subjective health damage and sick leave is *social support*.

As we have seen the workers in the Norwegian electric energy branch experience increased demands in their work. High decision authority and new kinds of problem solving can be straining on the individual, but is mediated by strong social supportive surroundings. This study shows small changes in social support from 1999 to 2002 in the electrical energy branch. This could be explained by several different reasons.

One explanation could be that the level of social support has always been satisfactorily high. If that is the case, there has been no need for improvement after the deregulation. Another explanation could be that the management took into account the influence the restructuring might have on the employees' health. Being aware of this, the management in the participating organisations arranged for a good work environment with focus on social support. It is been claimed that the focus on social support might have an ulterior profit motive when the organisation tries to create a "family" feeling at work. But social support is important for the employees whatever the motivation behind a social supportive network at work is. The changes in the energy branch did not change the *degree* of social support, but has maybe increased the *importance* of social support.

Even though this study reports small changes in psychological job demands, job control and social support, the degree and frequency of demands, control and social support might vary amongst groups of workers in the electric energy branch.

This study shows inequitable distribution of demands and control amongst leaders and non-leaders, but not all the findings are significant. Table 5.2 shows that there was a tendency of leaders meeting more psychological job demands than non-leaders. One reason for this might be that leaders possess active jobs, and are in positions which might demand much responsibility, important decision-making and risks of economical loss for the company. They are in charge of other employees, they probably have to make fast and difficult decisions and put in extra hours at work. Such aspects might create a demanding environment especially around the leaders in companies. One explanation for this can be that leaders have more time of service and posses the more powerful positions in the company. More power implies more

decision-making and more responsibility; or psychological job demands. Another explanation might be that leaders interpret situations differently than non-leaders. It is plausible to believe that leaders might be more accountable and show more commitment to the organisation than non-leaders who might have been in the organisation for a shorter period. A sense of responsibility and commitment might cause leaders to interpret situations differently, and they perceive more demands in their environment than non-leaders.

One reason why leaders do not report more stress and health complaints despite demands is the level of job control. According to Table 5.2 also the degree of job control proved to be unequally distributed between the employees in the Norwegian electric energy branch. The surveys showed that leaders reported generally more job control in their work, than non-leaders. One explanation for this could be that leaders are workers that have been in the organisation for a longer period than non-leaders. Longer time of service may involve a leading position or a place higher in the hierarchy. Leaders with more powerful positions may involve more decision making. A larger degree of decision latitude would imply more control to decide and influence own work situations as well as others' work situations.

When the branch was deregulated, a need for economic competence and marketing personnel occurred. This increased the number of white-collar workers in an industry which earlier was split in two distinct groups; manual workers and office workers. This might have heightened the numbers of leaders as well as the level of control. We can assume that leaders experience more decision latitude, because workers high in the organisational hierarchy, are surrounded by a work environment which provides learning opportunities and possibilities for problem solving and creative thinking. For the blue-collar workers, who might not experience a lot of cognitive challenges, the stimulation and problem solving might be of more practical character, with physical and concrete solutions. Such challenges might not be perceived as stimulation on a same level as abstract stimulation experienced by leaders. Leaders might also report more control and decision latitude at work because they are "nearer the top" of the organisational structure. Higher in the hierarchy will also include more power to influence and make decisions in the work environment. Non-leaders who scored lower on control, would have less decision latitude, stimulation and influence in their work than the leaders.

Decision making opportunities can be a problem in the organisation, a problem which can be solved by changing responsibilities between the hierarchical positions. But for the leaders, which already have a high degree of decision latitude, it is not necessarily favourable to gain even more decision making opportunities. An increase in decision latitude might increase the psychological strain, instead of reducing it, since increase in autonomy or control is theoretically not necessarily sufficient to compensate for the increased work intensity. The leaders' skill requirements can already be so high that additional requirements may become a demand rather than an opportunity of learning and coping. When the leaders' primary job demand is decision making, additional decision latitude opportunities are not likely to diminish stress (Karasek & Theorell 1990: 293).

Swedish studies also report the imbalance between leaders and non-leaders. According to studies of Swedish blue-collar workers the association between job strain and illness were stronger than for workers higher in the hierarchy. One reason for this is probably higher psychosocial and physical hazards amongst workers in this group. The blue-collars also work more shift work. This constant rotation between day and night work is associated with a decrease in decision latitude. Non-leaders were also found to have a larger degree of job insecurity than white-collars and leaders, both aspects which are related to a low degree of control (Karasek & Theorell 1990).

Summing up, this chapter reports that the analyses of job content only shows small overall changes for the variables *job demands*, *job control* and *social support* in the Norwegian electric energy branch from measurement 1 in 1999 to measurement 3 in 2002. However, on item-level, the *psychological job demands* and *job control* variables show significant changes from 1999 to 2002. The difference in changes in job content for *leaders* and *non-leaders* between 1999 and 2002 are found insignificant, apart from on the *demands* scale.

VI TEAM WORK

Teams and teamwork have become trendy terms in management literature in the 1990's (Kreitner, Kinicki, & Buelens 1999). The background for teamwork's raising popularity is its

way of increasing efficiency and cost-effectiveness of product development and problem solving, especially in non-automated workplaces (Giddens 1997). Market competition in the energy branch leads to a need for more flexible solutions in work design. Teamwork is such a flexible solution. The team approach to managing organisations is having diverse and substantial impact on organisations and individuals. If the trend we see today persists, tomorrow's organisations will be flatter, information based, and organised around teams (Kreitner et al. 1999).

Paul Osterman (1999) describes team work tendencies in his book *Securing Prosperity*. He shows how the numbers of establishments who use different "high-performance" work practises only have increased slightly from 1992 to 1997. One example on work practise which has increased in use is job rotation which was used by 26.6% of the establishments in 1992 and 55.5% in 1997. Another example is Total Quality Management, which increased from 24.5% in 1992 to 57.2% in 1997. The use of self-managed teams was the only exception to diffusion of high-performance work practises. Self-managed work teams were used by 40.5% of the questioned establishments in 1992, and by 38.4% in 1997 (Osterman 1999).

According to Paul Osterman's findings I expected to find similar tendencies in the Norwegian electric energy branch as I assumed a change in use of teams in the project period.

Table 6.1 *Number of employees working in team and changes in team organisation from 1999-2002*

Team organisation			
	1999	2000	2002
% working in teams	34.9%	32.9%	33.8%
Mean	1.65	1.67*	1.66
SD	.477	.470	.473
N	2376	1734	1144

*p< .05

Table 6.1 shows the percentage of employees working in team in the energy companies questioned. At measurement 1 34.9 % was working in team. At measurement 2 the percentage dropped slightly to 32.9%. At the third and last measurement in 2002 33.8% were working in teams. The number of people working in teams was fairly constant over this time span. The table also shows the same tendencies measured in mean and standard deviation.

There is a slight decrease in the use of teams from measurement 1 to measurement 2 (from 1999 to 2000), with a mean on respectively 1.65 and 1.67. The use of teams stabilises again from measurement 2 to 3, with a mean on 1.66. Table 6.1 further shows the results of a t-test of the changes in team from measurement 1 to 3. The change in use of team from 1999 to 2000 is significant. The observed changes from 1999 to 2002 and from 2000 to 2002 are, however, not significant (respectively $p = .164$ and 1.00).

Discussion

As we saw in Table 6.1 there was a small, but significant decrease in the number of people working in teams in the Norwegian electric energy branch from 1999 to 2000. One reason for the small decrease might be that up until the end of the decade work organisation, as team work, was still popular and something “new” and revolutionary. As the method of group- and teamwork became standard in the beginning of the new millennium, there was a flattening of its use. A decrease in use of team work is also reported by Paul Osterman (1999), so this study’s findings corresponds his findings. There are different reasons why these corresponding findings are surprising.

One explanation is the frame of reference. Osterman describes the United States of America, which is very different from Norway in both occupational structure and organisational practice. They have other norms and procedures which will influence on the organisation of work, and in this case, the use of team work. One could also assume that flexible solutions, as team work, are more welcomed in the USA than in Norway, where “new” concepts are either invented, or introduced earlier. Another factor which biases the frame of reference is the time period referred to, when Osterman’s findings are from a different time period than the measurements done in this study. Another aspect which might influence the difference between Norwegian and American findings, in use of team, is social context. One can hardly compare the entire American labour market, described in *Securing Prosperity*, with conditions in the Norwegian electric energy branch. The findings in this study is based on data from a very limited sector, the electric energy sector, so the similar tendencies in use of team observed in Osterman’s book and this study can not be logically explained by context.

According to Osterman another possible explanation for the surprisingly stable and narrow use of team work lies in the power structures of organisations. Osterman claims that work teams represent a bigger threat to established power relationships in the organisation, and

therefore also adapt slower than other work practises. The management might be reluctant to apply such flexible solutions as it would threaten their own position in the company (Osterman 1999). Osterman further explains that the decline or stagnation in use of team could come as a result of different organisational changes. Organisational changes like layoffs and downsizing lead to frequent shift in personnel, which makes it hard to successfully manage different work-teams. This is an explanation which also could be applied on the Norwegian electric energy branch as the branch experienced different restructuring actions throughout the 1990s.

VII OCCUPATIONAL HEALTH

Many companies in the Norwegian electric energy branch had to carry through rationalisation actions as a result of income limits and demands for efficiency after the introduction of the new energy act. When an organisation is restructuring, the employees' workload may increase and the opportunities for job control and social support may change too, which might be the case for the Norwegian electric energy branch as well. In order to improve working life it is important to identify determinants of occupational health, such as *job stress*, *job satisfaction* and *subjective health complaints*.

Robert Karasek and Töres Theorell show, through their Demand/Control Model, that *psychological job demands*, *job control* and *social support* at work influence employees' health. In this thesis I therefore assumed that *psychological job demands*, *job control* and *social support* may influence on *stress*, *job satisfaction* and *subjective health complaints* for workers in the Norwegian electric energy sector. To see what the relationship between these different dependent and independent variables are, I performed linear regression analysis, a multivariate analytical technique useful to describe the correlation between several variables (Skog 1998).

Tables 7.1 to 7.3 show regression analysis with *job stress*, *job satisfaction* and *subjective health complaints* as dependent variables. All the dependent variables are scales, which I elaborated in Chapter IV ("Measurement instruments"). The independent variables are *gender*, *year of birth*, *years of school*, *psychological job demands*, *job control*, *social support*, *teamwork*, *job stress*, *job satisfaction* and *leadership*. The *gender* variable is recoded into a dummy variable, where "men" are given the value 1 and "women" the value 0. The *year of birth* variable is an interval levelled variable, while the *years of school* variable is a ratio levelled variable. The *psychological job demands*, *job control*, *social support*, *job stress*, *job satisfaction* and *subjective health complaints* variables are all scales elaborated in Chapter IV. The *team work* variable is recoded into a dummy variable, where *member of a team* has the value 1, and *not member of a team* has the value 0. *Leadership* is also a dummy-variable where those who are leaders (with or without responsibility of personnel) are coded 1 and those who are not leaders are coded 0. The independent variables were added in different models or steps in the different analyses.

Job stress

Table 7.1 Regression analysis for variables predicting job stress

Job stress									
1999			2000			2002			
	Beta	SE B	B	Beta	SE B	B	Beta	SE B	B
Gender	.083	.909	3.57*	.117	1.08	5.21*	.132	1.31	5.79*
Year of birth	.020	.036	.035	.091	.045	.166*	.106	.055	.195*
Years of school	.122	.131	.736*	-	-	-	-	-	-
Demands	.398	.126	2.78*	.395	.152	2.91*	.408	.175	2.88*
Control	-.078	.130	-.521*	-.076	.150	-.540*	-.003	.176	-.023
Social support	-.320	.112	-1.96*	-.351	.136	-2.28*	-.365	.165	-2.39*
Team	.008	.627	.266	-.018	.739	-.668	-.050	.859	-1.77*
Leadership	.055	.700	1.94*	.050	.783	1.80*	.040	.898	1.36
(r ² adj.)	Step 1	.022		.019			.024		
	Step 2	.326		.349			.366		
	Step 3	.326		.349			.368		
	Step 4	.328		.351			.369		

*p < .05

Table 7.1 shows the regression analysis for variables predicting *job stress*. The first step includes the demographic variables *gender*, *year of birth* and *years of school*. Both *gender* and *year of school* predicts *job stress* significantly for all three measurements. *Year of birth* does not give a significant prediction of *job stress* for measurement 1 (1999), but gives significant prediction for the other two measurements (2000 and 2002). There was a positive relationship between *gender*, *age* and *years of school* and *job stress*. The older and more educated the respondents get, the more stress they report. The reported stress level is also higher for men than women. The adjusted r^2 was .022 in 1999, .019 in 2000 and .024 in 2002 for step 1, i.e. small changes from measurement 1 to measurement 3.

The next and second step includes *psychological job demands*, *job control* and *social support*. All the three independent variables were significant predictors of *job stress* for the first two measurements. At the last measurement in 2002 the *control*-variable did not give a significant prediction of *job stress*, which the *demand* and *social support* variables do. *Psychological job demands* were positively related to *job stress*, while *job control* and *social support* were negatively correlated. When I added the second step, the adjusted r^2 increased to .326 (1999), .349 (2000) and .366 (2002).

The third step in Table 7.1 added *team work* as a dependent variable. The variable is not a significant predictor for *job stress* for the first two measurements, but is significant for the third measurement. The significant relationship between *team work* and *job stress* was negative. For the third step the adjusted r^2 for the last measurement was .368. The two insignificant measurements at step 3 have consequently a stabile adjusted r^2 .

The fourth and last step in Table 7.1 added *leadership* as a dependent variable. *Leadership* gave a significant prediction of *job stress* for measurement 1 (1999) and measurement 2 (2000), but gave an insignificant prediction for the last measurement (2002). There was a positive relationship between *leadership* and *job stress*, and the adjusted r^2 increased to .328 in 1999, .352 in 2000 and .369 in 2002 when adding the *leadership*-variable in step 4.

Job satisfaction

Table 7.2 *Regression analysis for variables predicting job satisfaction*

Job satisfaction									
1999			2000			2002			
	Beta	SE B	B	Beta	SE B	B	Beta	SE B	B
Gender	-.047	.097	-.213*	-.089	.117	-.422*	-.087	.138	-.399*
Year of birth	.016	.004	.002	-.024	.005	-.004	.017	.006	.003
Years of school	.011	.014	.006	-	-	-	-	-	-
Demands	-.095	.014	-.069*	-.065	.017	-.050*	-.121	.019	-.089*
Control	.263	.014	.186*	.258	.017	.195*	.262	.019	.188*
Social support	.378	.012	.244*	.361	.016	.249*	.378	.018	.257*
Team	.049	.069	.184*	.059	.084	.231*	.042	.095	.155
Job stress	-.261	.002	-.027*	-.297	.003	-.031*	-.282	.003	-.029*
Leadership	.013	.075	.048	.042	.086	.159	.053	.096	.187*
(r ² adj.) Step 1	.001			.007			.006		
Step 2	.263			.257			.283		
Step 3	.265			.259			.284		
Step 4	.310			.316			.334		
Step 5	.310			.317			.335		

*p< .05

Table 7.2 shows the results of the regression analysis for variables predicting *job satisfaction*. In step one in the regression analysis the demographic variables *gender*, *year of birth* and *years of school* were predictors for the dependent variable *job satisfaction*. The analysis showed that only *gender* gave a significant prediction for *job satisfaction* for all three measurements. Neither *year of birth* nor *years of school* gave significant predictions for *job satisfaction*. There was a negative relationship between *gender* and *job satisfaction*, while there was a positive (but insignificant) relationship between *age* and *years of school* and *job satisfaction*. This means that women reported more *job satisfaction* than men, but the older and more educated a worker is, the more satisfied the worker gets. The adjusted r^2 for step 1 was .001 in 1999, .007 in 2000 and .006 in 2002.

In the second step I added the independent variables *psychological job demands*, *job control* and *social support*. The analysis showed that all three variables had significant impact on the dependent variable (*job satisfaction*) for all three measurements. *Psychological job demands* were negatively related to *job satisfaction*, while *job control* and *social support* were positively correlated.

When these variables were added, the adjusted r^2 increased considerably to .263 (1999), .257 (2000) and .283 (2002).

In the third step I tested *team work*'s predictability on *job satisfaction*. The analysis showed that *team work* could predict *job satisfaction* for measurement 1 and 2, but not for the last measurement. The relationship between *team work* and *job stress* was positive. The adjusted r^2 increased slightly for step 3 to .265 in 1999, .259 in 2000 and .284 for measurement 3 in 2002.

In contrast to team work, the relationship between *job stress* and *job satisfaction* proved to be negative. *Job stress* was added as an independent variable in a fourth step in Table 7.2. *Job stress* gave a significant prediction of *job satisfaction* for all three measurements. The adjusted r^2 increased by adding this step, and was .310 in 1999, .316 in 2000 and .334 in 2002.

The fifth step in Table 7.2 includes *leadership* as an independent variable, which was positively related to *job satisfaction*. The variable was not significant for the two first measurements, but significant for the last measurement in 2002. When I added the fifth step, the explained variance (adjusted r^2) scored .310 (1999), .317 (2000) and .335 (2002).

Subjective health complaints

Table 7.3 Regression analysis for variables predicting subjective health complaints

Subjective health complaints									
1999			2000			2002			
	Beta	SE B	B	Beta	SE B	B	Beta	SE B	B
Gender	-.163	.316	-2.44*	-.188	.378	-2.90*	-.208	.474	-3.29*
Year of birth	-.054	.012	-.030*	-.054	.016	-.034*	-.029	.020	-.019
Years of school	-.193	.046	-.091*	-	-	-	-	-	-
Demands	.188	.051	.459*	.167	.062	.428*	.133	.076	.337*
Control	-.148	.052	-.347*	-.136	.061	-.337*	-.122	.076	-.304*
Social support	-.114	.045	-.245*	-.169	.055	-.382*	-.124	.072	-.291*
Team	.001	.253	.011	.019	.302	.249	.007	.373	.092
Job stress	.235	.008	.082*	.189	.010	.065*	.124	.013	.044*
Job satisfaction	-.102	.078	-.338*	-.111	.090	-.363*	-.130	.121	-.448*
Leadership	-.055	.276	-.675*	-.107	.313	-1.33*	-.063	.387	-.768*
(r ² adj.)	Step 1	.039		.035			.041		
	Step 2	.111		.121			.094		
	Step 3	.110		.121			.093		
	Step 4	.147		.144			.102		
	Step 5	.154		.152			.112		
	Step 6	.156		.161			.115		

*p < .05

Table 7.3 shows the results of the regression analysis for variables predicting *subjective health complaints*. In step one on the regression analysis the demographic variables *gender*, *year of birth* and *years of school* were predictors for *subjective health complaints*. The analysis shows that all three independent variables were significant predictors for *subjective health* on all three measurements, except year of birth at measurement 3. All three control-variables (*gender*, *year of birth* and *years of school*) were negatively related to *subjective health complaints*. This means that women complain more of health issues than men, together with younger and less educated workers. The adjusted r² for step 1 was .039 in 1999, .035 in 2000 and .041 in 2002.

In the second step I added the independent variables *psychological job demands*, *job control* and *social support*. The analysis showed that all three variables had significant impact on the dependent variable (*subjective health complaints*) on all three measurements. *Psychological job demands* had a positive relationship with *subjective health complaints*, while *job control* and *social support* were negatively related. The explained variance increased for step 2 to .111 for measurement 1 (1999), .121 for measurement 2 (2000) and .094 for measurement 3 (2002).

In the third step I tested *team work's* predictability on *subjective health complaints*. The analysis showed that *team work* was positively related to *subjective health complaints*, but the analysis showed no significant effects on the dependent variable.

The fourth step included the *job stress* variable, which related positive to *subjective health complaints*. The variable gave a significant prediction of *subjective health complaints* for all three measurements. The adjusted r^2 increased to .147 in 1999, .144 in 2000 and .102 in 2002 when adding the fourth step.

Table 7.3 also included a fifth step; *job satisfaction*. *Job satisfaction* proved to be negatively related to *subjective health complaints*, and was a significant predictor for *subjective health complaints* for all three measurements. When I added the fifth step, the adjusted r^2 increased to .154 in 1999, .152 in 2000 and .112 in 2002.

The sixth and last step in Table 7.3 added *leadership* as an independent variable, which proved to be negatively related to *subjective health complaints*. The variable was a significant predictor for *subjective health complaints* for all three measurements, and increased the explained variance to .156 in 1999, .161 in 2000 and .115 in 2002.

Discussion

This study shows different determinants of occupational health in the Norwegian electric energy branch. The effect of several independent variables, as *psychological job demands*, *job control*, *social support*, *team work* and *leadership*, was shown on the dependent variables *job stress*, *job satisfaction* and *subjective health complaints* in tables 7.1 to 7.3.

The workers in the Norwegian electric energy branch reported a positive relation between psychological job demands and job stress. This means that the more demands the workers

report, the more job stress they also report. Job stress, which occurs when the worker experiences a difference between own resources and the demands from the environment, can influence negatively on workers health (Thoits 1995). As this study shows, the workers in the electric energy branch in Norway reported some increase in demands from measurement 1 to measurement 2. The relationship between psychological job demands and occupational stress is, consequently, getting stronger in the project period.

Job control is known as a buffering mechanism against stress and demands at work (Karasek & Theorell 1990). This is also seen in this study amongst Norwegian electric energy workers. The workers reported a negative correlation between job control and job stress, which means that workers with control over own work situation experienced less job stress. When the individual is exposed to stressors he or she has to take an evaluation of the situation and chose the coping strategy which suits best. It is the decision latitude which gives the worker self esteem and a feeling of control over the situation. The coping process is accumulating, because higher self esteem gives motivation for new assignments, which increases coping skills and control, which again leads to higher self esteem (Lazarus & Folkman 1984). The relationship between control and occupational stress is seen for the first to measurements, but are not significant for the last measurement in 2002. This may mean that the coping strategies earlier used amongst the Norwegian electric energy workers no longer function as coping strategies and that the job stress no longer is controlled. Karasek and Theorell (1990) report the same tendency for the relationship between stress and job control and psychological job demands as seen in this study. They claim that high demands and low control will result in physiological and psychological stress and possible disease.

Also social support shows a negative relationship to job stress amongst the Norwegian energy workers. The degree of social support the workers received in their work situation influenced the amount of job stress they reported. The more social support experienced at work, the less occupational stress. Several studies have documented that social support is one of the most important moderator of people's reactions to stressors (Mitchell & Larson 1987). The relationship between social support and job stress in the Norwegian electric energy branch is getting stronger through the project period, which might indicate that the importance of social support is identified throughout the period.

Teamwork involves the same relational mechanisms as social support, and the group might be supportive when needed. The team can constitute a close social network, which can provide backing through stressful periods. The regression analysis for the team-variable turned out to be insignificant for the first two measurements. For the last measurement in 2002, however, there is a negative relation between teamwork and job stress. This means, as reported for social support, the workers who were involved with teamwork reported less job stress. Further leadership and job stress are positively related, which means that those who reported to be leaders also reported more stress than the non-leaders.

The workers in the Norwegian electric energy branch reported a negative relation between psychological job demands and job satisfaction. The more demands the workers reported, the less satisfied they were with their work situation. The workers feel content and satisfied at work if their needs are fulfilled, motives are achieved and goals are met. When the workers, on the other hand, experience too much demands, this will influence their well-being and job satisfaction. The negative relationship between psychological job demands and job satisfaction in the electric energy branch was getting stronger from measurement 1 to measurement 3.

As job control functions as a buffer against strain and demands at work, this study shows a positive correlation between job control and job satisfaction. This means that if the workers feel in control over their own work situation the probability of them experiencing job satisfaction increases. This positive relationship between control and job satisfaction, which is getting stronger from 1999 to 2002, is seen for all three measurements. This can be an indicator that the Norwegian electric energy branch seems to offer enough job control for the workers, so they feel in control in their work situation.

Also social support shows a positive relationship with job satisfaction for all three measurements. This means that the degree of social support the workers receive in their work situation, influence on the job satisfaction they report. The more social support the Norwegian electric energy workers experienced at work, the more job satisfaction they reported. The positive correlation between job satisfaction and social support is getting stronger through the project period.

Also the relationship between team work and job satisfaction is positive and significant, at least for the two first measurements. The last measurement in 2002 shows an insignificant relationship between team work and job satisfaction. Teamwork can create social network in the organisation and a social supportive environment, which means that workers who are members of a team will benefit from the close collaboration such group-based work constitute. Team work and social support are closely connected, and as reported above; social support also has a positive effect on job satisfaction. As the use of teams increase throughout the project period the relationship between teamwork and job satisfaction gets stronger from 1999 to 2000. The positive relationship between leadership and job satisfaction, which indicates that leaders have more job satisfaction than non-leaders, is insignificant for the two first measurements, but significant for the last.

The workers in the Norwegian electric energy branch reported a positive relation between psychological job demands and subjective health complaints. This means that the more demands the workers reported, the more subjective health complaints they experienced in the project period. One explanation for this correlation is the nature of job demands, which can be both straining and challenging for workers. Even though a certain level of demands is necessary for learning to occur, too many demands can damage the health of the workers. The negative effect of too many demands can be moderated by job control, which was confirmed in this study. The analysis shows a negative correlation between job control and subjective health complaints. The workers who reported high control over own work situation, reported a lower probability of subjective health complaints. The negative relationship between control and subjective health complaints is seen for all three measurements, but the strength of the relationship was getting significantly weaker throughout the project period.

These findings are confirmed by Karasek and Theorell (1990) who claim that low decision latitude is strongly associated with physical illness and subjective health complaints. Workers with control have the possibility to decide over own work situation, as when to take a break, which tasks to do and when to do them. Control over own working situation and participation at work is important for coping, and makes the working environment “more rewarding and less threatening” (Ganster 1989). Workers with control will better cope with the demands and challenges at work and consequently report less health complaints.

It is not only job control which moderates a defiant work environment in the Norwegian electric energy branch. Also social support shows a negative correlation with subjective health complaints. Social support function as a buffer between stressors at work and negative health outcomes. This means that the workers who receive social support at work, also report less health complaints. The workers in the Norwegian electric energy branch reported that social support became more significant as a buffer against health complaints through the project period.

The effect and consequences of demand, control and social support on health seen in this study is also shown by J. V. Johnson (1986). Johnson used interviews and follow-up studies from 1976 to 1982 in registries of a random sample of Swedish employees. When he searched for possible causes of the reported health conditions he found, it was not due to marital state, age, sex, socioeconomic status, income or physical job demands. He found that workers who reported poor social support, high demands and low decision latitude also reported more subjective health complaints. Amongst the symptoms were heart disease, mental fatigue, digestive system diseases and back pain. The same tendencies have later been reported for cardiovascular deaths and diseases. Those who reported much job demands and low social support had the highest heart disease prevalence. The group with high demands scored highest for other illnesses as well. The group of workers who reported low demands and high control, not considering social support, also reported lowest heart disease prevalence and died later from cardiovascular diseases than others. Other studies have focused on social support relations effect on subjective health. Social support is generally associated with dramatically lower levels of depression, burnout, anxiety and cardiovascular diseases in the combined female and male populations (Karasek & Theorell 1990, Cohen and Syme 1985, House 1981 and Johnson 1986).

This study shows that all three elements from the Demand/Control Model (psychological job demands, job control and social support) together with team work and leadership had an effect on job stress, job satisfaction and subjective health complaints in the Norwegian electric energy branch. The regression analyses, reported above, detected that *demands, control, social support, team work* and *leadership* had influence on *job stress, job satisfaction* and *subjective health complaints*. The results showed that *psychological job demands* had a negative effect on *job stress, job satisfaction* and *subjective health complaints*. *Job control* and *social support* had, on the other hand, a positive effect on the same dependent variables. The *leadership* variable was positively related

to *job stress* and *job satisfaction*, but negatively related to *subjective health complaints*. In this study teamwork had, generally, little effect on the dependent variables, except a positive relationship with *job satisfaction*.

VIII CONCLUSION

Main empirical findings

The results found in this study are in accordance with the original hypothesis of Robert Karasek and Töres Theorell (1990) presented in *Health Work: Stress, Productivity and the Reconstruction of Working Life*. They hypothesized that *psychological job demands* may have a negative effect on the health of workers, but the negative effect of demands can be buffered with *job control* and *social support*.

In this study only small overall changes are found in the analysis for the variables *job demands*, *job control* and *social support* in the Norwegian electric energy branch from measurement 1 (1999) to measurement 3 (2002). However, on item-level, the *demands* and *control* variables showed significant changes from 1999 to 2002. The use of *team work* decreased significantly in the same period. The results of the regression analysis showed that *psychological job demands* had a negative effect on *job stress*, *job satisfaction* and *subjective health complaints*. *Job control* and *social support* had, on the other hand, a positive effect on the same dependent variables. In this study *team work* had little effect on the dependent variables. The *leadership* variable showed a significant negative relationship with *subjective health complaints*, but was mostly insignificantly related to *stress* and *satisfaction*.

The final conclusion from this thesis is that there have been small changes in workers job content (*psychological job demands*, *job control* and *social support*), in the Norwegian electric energy sector, but that these changes have an influence on occupational health (*job stress*, *job satisfaction* and *subjective health complaints*). *Psychological job demands* deteriorate the situation for the workers, whilst *job control* and *social support* improve the well-being of the employees in the Norwegian electric energy sector.

The results in this study corroborate previous results and suggest that the Demand/Control Model can be used as a practical approach in understanding healthy work in the Norwegian electric energy branch.

Methodological considerations and study limitations: Lessons for the future

The three surveys this thesis is based on, follows methodological guidelines and rules for quantitative research designs. Despite this, the design might represent limitations and considerations which are important to be aware of.

As mentioned earlier in the thesis, one can question if the data used in this thesis actually *can* describe the consequences of the New Norwegian Energy Act of 1991. When data was collected 8 to 12 years after the deregulation in 1991, it can hardly give us useful information of the resolution. Even though the data *can* tell us something about the effects the deregulation resolution and the following reorganisation, there are other solutions to the validity issue. One answer to this limitation would be to have carried through the surveys closer up to the years following the implementation of the Energy Act of 1991. A problem with this would be that the changes in the electrical energy companies in Norway arose at different moments of time for all companies. The basis for comparison would be complicated by the fact that the companies were going through different phases at different times. A comparison would also be complicated by the continuous repositioning between the different companies. The power balance between the companies changed due to mergers and purchases, and what one company did could have consequences another company. So with an ongoing change in positioning and balance of power, reliability and validity issues might occur in the years close to the deregulation resolution.

One solution and alternative design could be to compare data collected both *before* and *after* the new Energy Act was effectuated in 1991. With information gathered both before and after the resolution, the actual changes and consequences could more easily be detected. One obvious problem with this solution is the ability of being foresighted and carry through surveys in the branch previous to the deregulation actions. A study of the regulated energy branch had to be conducted before any resolutions and suggestions of deregulation were proposed, or else the workers in the electrical energy branch might perceive changes in both health and stress level merely as a result of the attention given by the researchers and the management, a reaction called the *Hawthorne effect*.²⁰

²⁰ Efficiency increased in a manufacturing company as a result of the attention and care given by the management, and not because the actual work conditions were changed to the better (Skog 1998).

Another limitation with this study is that it only examines one out of many branches. Even though the sample was large and representative, and was selected in several companies, it only included the Norwegian electric energy branch. Further examination could include a bigger variation of organisations in Norway as well, as the Demand/Control Model probably could be applied as a practical approach to work environment issues in several other branches and sectors.

Further, the present study was carried out in a branch dominated by men, and by the logic of engineering. A future project could study a sector different from the electric energy branch, both in gender composition and profession. Possible useful findings could be discovered, as well as an interesting basis of comparison between the branches. One example could be *care professions*, a sector which also has experienced privatisation during the recent years. The work organisation in this sector usually involves large degrees of job demands and low decision latitude, a situation which probably will worsen if the sector gradually becomes controlled by the market (Isaksen 2003).

The fairly short project period for this study represents another limitation. The first survey was conducted in 1999 and the third and last in 2002, which covers a time span of four years. If the project period was over a longer period of time, with additional surveys, a possibility of discovering new and different aspects might occur.

Another limitation to this study is that length of education only is measured at measurement 1 in 1999. The purpose of excluding the “years of school” variable at measurement 2 (2000) and measurement 3 (2002) was merely practical considerations. One could assume that a change in education level from 1999 to 2002 was a reality for very few respondents, and by excluding the variable in 2000 and 2002 one would confine an already extensive questionnaire. This is a limitation one should be aware of. Ideally the variable (used for control purposes in this study) should have been measured and included in the analyses for all three measurements. Alternatively there could have been a question reporting the respondents change in educational level from measurement 1 to measurement 3.

The study could also profit by methodological triangulation across data sources like multiple informants in different organizational units and levels, and across data collection methods like individual survey data, interviews and document analysis. Surveys or questionnaires limit

the respondents' replies, and represents a neutral and specific relation between the researcher and respondent. With ethnographical or qualitative interviews, the situation are characterised by less boundaries which opens for exchange of both explicit and implicit information. Different aspects might therefore easier be revealed by doing personal interviews with the respondents, than impersonal postal surveys as in this study. A further examination of the consequences of deregulation on job content and occupational health could be done by combining quantitative research with interviews.

Future examination of the Demand/Control Model and the electric energy branch could be done by analysing supplementary variables. There is a probability that *personality* might influence how individuals handle stress and demands at work. One personality trait often associated with myocardial infarction is *Type A personality*. Johanson and Lindström (1975) found that young men with Type A behaviour react more vigorously than others, both psychologically and physiologically when they are exposed to psychologically demanding situations that are outside their control (Karasek & Teorell 1990). Another aspect which could influence on the amount of stress and demands are *types of work* internally in the electric energy companies. After the deregulation the focus shifted from engineering to economic considerations, and new positions in the organisations had to be filled. Future research could therefore address the question if other variables as for instance *personality* or *type of work* could have an influence on job content and occupational health in the Norwegian electric energy branch.

Last, but not least, future research could provide further knowledge on individual and organisational learning and health. This study shows that learning and decision latitude has a positive effect on health and stress, but one can question if unlimited learning demands have a positive effect on health as well. One might assume that huge learning demands may be too overwhelming and therefore function against its purpose and lead to ill health.

Consequences of deregulation and reorganisation on occupational health

Introductorily I posed the question if the new kinds of work and organisational arrangements represented an end to alienation and distress at work for the employee, or if the transformation of work represents new and demanding aspects to workers health and well-being.

The present working world introduces obscure and abstract goals for many workers, as is do for workers in the electric energy branch. As this thesis has showed, the deregulation and reorganisation of work in the Norwegian electric energy branch has represented both new challenges and job demands for the workers in the branch. This branch has gone through major changes as a result of the deregulation, where efficiency and competitiveness has been brought into focus. Physical challenges and practical problems have in a larger degree been replaced by a need for problem-solving and creativity on a cognitive, not longer practical, level. One could therefore assume that the distress and alienation is still influencing workers in the branch. But another important suggestion in this thesis is that the new demands and challenges do not constitute a threat to the workers health, as long as the worker experience control and social support in their work day. Even if the changes and new demands easily can be damaging to the employees health, social support at work can function as a buffer against such harmful work environment.

Robert Karasek and Töres Theorell (1990) claim that not all companies appreciate the significance of social support. Some organisations consider social support as unimportant, and even discourage a healthy, supportive environment. Social relationship in the organisation is considered unimportant in many workplaces, and potential stress and strain can be even more damaging to the workers. Other organisations are, on the other hand, well aware of this great importance social support is playing in the working life of thousands of people, and arrange for and appreciate social support mechanisms as an important buffer and resource against stress and health complaints.

According to Karasek and Theorell (1990) such healthy and supporting organisations are becoming more and more important as: “the industrial development (...), leveraged by the rapidly escalating change to a global economy, is inconsistent with a healthy future for the human race”. But as they wisely conclude; even if the present industrialisation is unhealthy, a return to the past is unthinkable (Karasek & Theorell 1990: 313).

REFERENCES

- Abercrombie, N., Hill, S. and Turner, B. (1994): *Dictionary of Sociology*. England: Penguin Books.
- Agervold, M. (1998): *Det psykosociale arbeidsmiljø: fra videnskabelig arbejdsledelse til arbejdsmiljøpsykologi*. Arbeidsmiljømodeller. Århus: Aarhus Universitetsforlag.
- Andersen, L. (1998): Moderne organisering og fravær. Motsetninger i arbeidsbegrepet, in Nilsen, T.: *Mot et bedre arbeidsliv*. Bergen: Fagbokforlaget.
- Argyris, C. & Schön, D. A. (1978): *Organisational learning*. Reading, MA: Addison-Wesley.
- Argyris, C. & Schön, D. A. (1996): *Organisational learning II. Theory, method and practice*. New York: Addison-Wesley Publishing Company.
- Atkinson, J. (1984): *The Flexible Firm and the Shape of Jobs to come*. Labour Market Issues, no. 5. Oxford: The Trade Union Research Unit.
- Benach, J., Gimeno, D. & Benavides, F. (2002): *Types of employment and health in the European Union*. The Foundation for the Improvement of Living and Working Conditions.
- Bowitz, E., Rosnes, O. & Vennemo, H. (2001): *Mer for pengene, men dårligere miljø – Kraftbransjen i Norden fra plan til marked. Energi og miljø ved et tidsskille – samfunnsfaglige perspektiver fra forskningsprogrammet SAMRAM*. Oslo: Norges forskningsråd.
- Braun, S. & Hollander, R. B. (1988): Work and depression among young women in the Federal Republic of Germany. *Women and health*. 14: 5-24.
- Cangelosi, V. E. & Dill, W. R. (1965): Organisational learning observations: Toward a theory. *Administrative Science Quarterly*, 10: 175-203.
- Casey, C. (1995): *Work, Self and Society -after industrialism*. London: Routledge.
- Castells, M. (2000): *The Rise of the Network Society*. UK: Blackwell Publishers Ltd.
- Cohen, S. & Syme, S. L. (1985): *Social Support and Health*. New York: Academic Press.
- Collinson, D. L. & Collinson, M. (1997): Delayering Managers: Time-Space Surveillance and its Gendered Effects. *Organisation*, 4/3. 375-407.
- Cooper, C. L. (1981): *The stress check*. New York: Prentice Hall.
- Cozby, P. C. (1997): *Methods in Behavioural Research*. California: Mayfield Publishing Company.
- Crossan, M., Lane, H. & White, R. (1999): An organizational learning framework: From intuition to institution. *Academy of Management Review* (24). 3: 522-537.
- de Jonge, J. & Kompier, M. A. J. (1997): A Critical Examination of the Demand-Control-Support Model from a Work Psychological Perspective. *International Journal of Stress Management* (4). 4: 235-258.
- Dement, W. (1969): The biological role of REM sleep. In *Sleep Physiology and Pathology: A Symposium*, ed. A. Kales. Philadelphia: Lippincott.

- Di Martino, V. (Ed.) (1992): *Conditions of work digest on preventing stress at work*. Geneva: International Labour Office.
- Ebeltoft, A. (1990): *Psykososialt arbeidsmiljø i praksis*. Oslo: TANO AS.
- Eriksen, H. R., Ihlebæk, C. & Ursin, H. (1999): A scoring system of subjective health complaints. *Journal of Public Health*, 27, 1, 63-72.
- Farsund, A. A. (1998, 195): *Offentlige rammebetingelser I kraftpolitikken – en sammenligning av Eu, Danmark, Nederland, Norge og Tyskland*. Rogaland Research 1998/195.
- Farsund, A. A. (1998, 320): *Energiøkonomisering – fra offentlig tjeneste til kommersiell virksomhet?* Rogaland Research 1998/320.
- Färm, G. (2000): *Magra organisationer i arbetslivet*. Report from convention arranged by Swedish Council for Work Life Research (7/10 1999).
- Fiol, C. M. & Lyles, M. A. (1985): Organisational learning, *Academy of Management Review*, 10, 803-813.
- Fischer, G. & Sortland, N. (1989): *Innføring i organisasjonspsykologi*. Bergen: TANO AS.
- Flecker, J. & Hofbauer, J. (1998): Capitalizing on Subjectivity: The 'New Model Worker' and the Importance of Being Useful, in Thompson & Warhurst: *Workplaces of the Future*. London: MacMillan Press LTD.
- Ganster, D. C. (1989): Worker control and well-being: A review of research in the workplace. In S. L. Sauter, J. J. Jr. Hurtell & C. L. Cooper (Eds.), *Job control and worker health* (John Wiley & Sons: New York), pp. 3-23.
- Ganster, D. C. & Mayes, D. G. (1988): *A Field Test of the Interactive Effects of Job Demands and Control on Worker Well-being*. Paper presented at the Annual Meeting of the Academy of Management, Anaheim, CA.
- Giddens, A. (1997): *Sociology*. UK: Polity Press.
- Gründemann, R. W. M., Nijboer, I. D. & Schellart A. J. M. (1991): *The work-related character of work disablement* (Report no. 1). Den Haag: Ministerie van Sociale Zaken en Werkgelegenheid.
- Hackman, J. R. & Oldham, G. R. (1976): Motivation through the design of work: Test of a theory. *Organ Behav Hum Perform*, 16, 250-279.
- Hansen, H. T. (ed.) (1999): *Kunnskapsstatus for den nordiske trygdeforskningen på 1990-tallet*. SNF-report 12/99. Bergen: Institute for Research in Economics and Business Administration (SNF).
- Hellesøy, O. (1990): Lederstress, sosialt samspill og mestring i Greve & Kaufmann (red.) *Ledelse, psykologiske og strategiske perspektiver*. Oslo: Tano.
- House, J. S. (1981): *Work Stress and Social Support*. Reading, Mass.: Addison-Wesley.

- Isaksen, L. W. (ed.) (2003): *Omsorgens pris. Kjønn, makt og marked i velferdsstaten*. Oslo: Gyldendal Norsk Forlag.
- Johanson, G. & Lindström, B. O. (1975): *Paced and un-paced work under salary and piece-rate conditions*. Report no. 459, Department of Psychology, University of Stockholm.
- Johnson, J. V (1986): *The Impact of the Workplace Social Support, Job Demands, and Work Control under Cardiovascular Disease in Sweden*. Ph.D. diss., Johns Hopkins University. Distributed by Department of Psychology, University of Stockholm, Report no. 1-86.
- Johnson, J. V. & Hall, E. M. (1988): Job strain, work place support, and cardiovascular disease: A cross-sectional study of a random sample of the Swedish working population. *American Journal of Public Health*, 78 (10), 1336-1342.
- Karasek, R. A. (1979): Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly*, 24: 285-307.
- Karasek, R. A. (1985): *Job content questionnaire*. Department of Industrial and Systems Engineering, University of Southern California, Los Angeles.
- Karasek, R. A. (1992): Stress prevention through work reorganisation: A summary of 19 international case studies. In V. Di Martino (Ed.), *Conditions of work digest on preventing stress at work*, 11 (2), 23-41.
- Karasek, R. A., Gardell, B. & Lindell, J. (1987): Work and non-work correlates of illness and behaviour in male and female Swedish white-collar workers. *Journal of Occupational Behaviour* 8: 187-207.
- Karasek, R. & Theorell, T. (1990): *Healthy Work: Stress, Productivity, and the Reconstruction of Working Life*. New York: Basic Books.
- Katz, D & Kahn, R. L. (1978): *The Social Psychology of Organisations*. New York: Wiley.
- Kaufmann, A. & Kaufmann, G. (1998): *Psykologi i organisasjon og ledelse*. Bergen: Fagbokforlaget.
- Kauppinen-Toropainen, K. (1981): *Job Demands and Job Content: Effects on Job Dissatisfaction and Stress*. Department of Psychology, Institute of Occupational Health. Helsinki.
- Kets de Vries, M.F.R. & Balazs, K (1997): *The Downside of Downsizing in Human Relations*. Vol. 50, No 1.
- Kohn, M. & Schooler, C. (1973): Occupational experience and psychological functioning: An assessment of reciprocal effects. *American Sociological Review* 38: 97-118.
- Kohn, M. & Schooler, C. (1982): Job Conditions and Personality: A Longitudinal assessment of their reciprocal effects. *American Journal of Sociology* 87: 1257-1286.
- Kompier, M. A. J., Gründemann, R. W. M., Vink, P. & Smulders, P. G. W. (1996): *Now to work! Ten examples of the successful reduction of sickness absenteeism*. Alphen aan den Rijn: Samson Bedrijfsinformatie.

- Kreitner, R., Kinicki, A. & Buelens, M. (1999): *Organizational Behaviour*. London: McGraw-Hill.
- Landsbergis, P. A. (2003): The Changing Organization of Work and the Safety and Health of Working People: A Commentary. *Job Occupational Environment Med* (45), 1:61-72.
- Landsbergis, P. A., Schnall, P. L. & Cahill, J. (1999): The Impact of Lean Production and Related New Systems of Work Organization on Worker Health, in *Journal of Occupational Health Psychology*. Vol.4, No 2, 108-130
- Lazarus, R. S. (1966): *Psychosocial Stress and the Coping Process*. New York: McGraw-Hill.
- Lazarus, R. S. & Folkman, S. (1984): *Stress, Appraisal, and Coping*. New York: Springers.
- Leknes, E., Opedal, S. & Reiersen, J. E. (2000): *Fristilling og deregulering av offentlig virksomhet. Konsekvenser for Ofoten og Vesterålen*. Rogalandsforskning. RF-2000/277.
- Levine, S. & Ursin, H. (1991): What is stress? In M.R. Brown, G.F.Koob & C. Rivier (Eds.), *Stress. Neurobiology and Neuroendocrinology*. New York: Marcel Decker, Inc.
- Locke, E. A. & Henne, D. (1986): Work motivation theories. C. L. Cooper & I. Robertson (Eds.): *International Review of Industrial and Organisational Psychology*. England: Wiley.
- Lysgaard, S. (1961): *Arbeiderkollektivet*. Oslo: Universitets Forlag.
- Meisner, M. (1971): The long arm of the job. *Industrial Relations Journal*, October: 239-260.
- Mikkelsen, A., Landsbergis, P. A., Bakke, Å., Gundersen, M. & Jøsendal, K. (2002): Company efforts to improve occupational health? The case of the Norwegian electric energy sector in a restructuring period. *Review of Public Personnel Administrations*.
- Mikkelsen, A., Nybø, G. & Grønhaug, K. (2002): Exploring the Impact of Deregulation on HRM: The case of the Norwegian Energy Sector. *International Journal of Human Resource Management*, 13, 6. September, 1-16.
- Mikkelsen, A., Øgaard, T. & Landsbergis, P. A. (2002): *The effects of dimensions of psychological job demands and job control on mastery of work and occupational health*. Stavanger: Rogaland Research.
- Mitchell, T. R. & Larson, J. R. (1987): *People in Organizations. An Introduction to Organizational Behaviour*. London: McGraw-Hill.
- Nord (1997: 15): *Review of psychological and social factors at work and suggestions for the General Nordic Questionnaire (QPS Nordic)*. Copenhagen: Nordic Council Of Ministers.
- Olberg, D. (1990): *Fleksibilitet og fagorganisering*. FAFO-rapport nr. 097.
- Osterman, P. (1999): *Securing prosperity*. USA: The Century Foundation.
- Parker, S. K. & Wall, T. D. (1998): *Job and Work Design. Organising Work to Promote Well-being and Effectiveness*. London: Sage Publications.

- Parkes, K. R., Mendham, C. A. & Rabenau, C. von (1994): Social support and the demand-discretion model of job stress: tests of additive and interactive effects in two samples? *Journal of Vocational Behaviour*, 44, 91-113.
- Quinn, R. E., Shepard, L. J. (1974): *The 1972-73 Quality of Employment Survey*. Ann Arbor, MI: Institute for Social Research, University of Michigan.
- Reilly, P. A. (1998): Introduction: Flexibility for the Individual, Organisation and Society. *European Journal of Work and Organizational Psychology*. (7/98). Psychology Press Ltd.
- Ringdal, K. (2001): *Enhet og mangfold*. Oslo: Fagbokforlaget.
- Rolfesen, M. (ed.) (2000): *Trendenes tyranni*. Bergen: Fagbokforlaget.
- Rose, D. & Sullivan, O. (1996): *Introducing Data Analysis for Social Scientists*. UK: Open University Press.
- Schnall, P. L., Landsbergis, P. A. & Baker, D. (1994): Job strain and cardiovascular disease. *Annual Review of Public Health*, 15, 381-411.
- Selye, H. (1956): *Stress of life*. New York: McGraw-Hill.
- Sennett, R. (2001): *Det fleksible mennesket -personlige konsekvenser av å arbeide i den nye kapitalismen*. Bergen: Fagbokforlaget AS.
- Skog, O. (1998): *Å forklare sosiale fenomener. En regresjonsbasert tilnærming*. Oslo: Ad Notam Gyldendal.
- Sosialt utsyn (2000): Statistiske analyser (SA 35), published by Statistics Norway.
- Sparrow, P. (1998): The Pursuit of Multiple and Parallel Organisational Flexibilities: reconstituting Jobs. *European Journal of Work and Organizational Psychology*. (7/1998). Psychology Press Ltd.
- SSB (2003): *Statistical Yearbook of Norway*. Oslo.
- The Tokyo Declaration (1998): Japan Tokyo Medical University. 1998; 56 (6): 760-7.
- Theorell, T. (1989): Personal control at work and health. In *Stress, personal control and health*, ed. A. Apples and A Steptoe. New York: Wiley.
- Theorell, T., Michélsen, R. and Nordemar (1991): Tre arbeidsmiljøindex som anvænt i Stockholmsundersökningen 1. In M. Hagberg and C. Hogstedt (Eds.), *Stockholmsundersökningen 1*. Stockholm: Music Books.
- Thoits, P. (1995): Stress, Coping, and Social Support Processes: Where are we? What next? In *Journal of Health and Social Behaviour* 1995.
- Toffler, A. (1970): *Future shock*. New York: Bantam.
- Thompson, P. & McHugh, D. (2002): *Work organisations*. UK: Palgrave.

- Tregaskis, O., Brewster, C., Mayne, L., Hegewisch, A. (1998): Flexible Working in Europe: The Evidence and the Implications. *European Journal of Work and Organizational Psychology* (7/98). Psychology Press Ltd.
- Ursin, H. , Endresen, I. & Ursin, G. (1988): Psychological Factors and Self-reports of Muscle Pain. *European Journal of Applied Physiology and Occupational Physiology*, 57, 282-290.
- Ursin, H. (1997): Sensitization, somatization, and subjective health complaints: A review. *International Journal of Behavioural Medicine*, 4, 2, 105-116.
- Yerkes, R. M. & Dodson, J. D. (1908): The relation of strength of stimulus to rapidity of habit-formation. *Journal of Comp Neurol Psychology* 18: 459-482.
- Watson, T. J. (1995/2003): *Sociology, Work and Industry*. London: Routledge.
- Weber, M. (1990): *Makt og byråkrati*. Oslo: Gyldendal.
- Whyte, W. F. (1948): *Human Relations in the Restaurant Industry*. New York: McGraw-Hill.